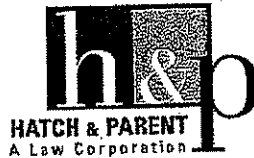


## **PETITION EXHIBIT 11**

**COPY**



11911 San Vicente Boulevard, Suite 350  
Los Angeles, CA 90049  
Telephone: (310) 500-4600  
Fax: (310) 500-4602

Steven L. Hoch

(310) 500-4611  
SHoch@HatchParent.com

May 22, 2007

**VIA FACSIMILE AND MAIL**

Ms. Lori Okun  
Office of Chief Counsel  
State Water Resources Control Board  
1001 I Street, 22nd Floor  
Sacramento, CA 95814

Re: 425 Tennant Ave, Morgan Hill, Santa Clara County; Cleanup Or  
Abatement Order No. R3-2006-0112, Which Amends Cleanup Or  
Abatement Order No. R3-2005-0014

Dear Ms. Okun:

The City of Morgan Hill ("City") is requesting that the Regional Water Quality Control Board, Central Coast Region ("RWQCB") take all appropriate action to require that the operation of the City's Tennant Well be included as part of the Basin Cleanup required of Olin Corporation under CAO # R3-2006-0112, which amended Cleanup Or Abatement Order No. R3-2005-0014. ("CAO"). In making this request, the City stands ready to meet with the RWQCB and Olin to work out details of any financial or technical arrangements required to assure continued operation of the Tennant Well for as long as the RWQCB believes it is actively serving the goals set forth in the CAO.

**1. Background**

The Tennant Well and its perchlorate removal system is directly south of the Olin site.<sup>1</sup> It has been in continuous operation as was requested by the Board, since October, 2004. Since that time it has been removing Olin's perchlorate measured since the beginning of 2006 at an average of 6ppb. Of note, the perchlorate concentrations measured this year have been above 6ppb. As you also know, the operation is necessary to supply water to the citizens of Morgan Hill due to perchlorate impacts in other areas of the City's water infrastructure.

The RWQCB authored a letter to Olin dated May 13, 2003 in which stated, in pertinent part:

<sup>1</sup> The CAO states: "The Dischargers caused or permitted perchlorate-containing wastes to be discharged to the soil at the Site and to groundwater underlying, downgradient to the south... of the Site. (Paragraph 25).

"The extraction and treatment of perchlorate contaminated water from the Tennant Avenue well will reduce the mass of perchlorate leaving the area and will provide partial hydraulic containment of the plume within the well's area of influence."

On October 30, 2003, the City requested permission from the RWQCB to operate the Tennant Well. The RWQCB responded on May 11, 2004 stating that Tennant operation should be continuous. The City has complied, and since the commencement of the removal system operations, the Tennant Well has not been taken off line except for required maintenance.

## **2. The Tennant Well's Remediation of Olin's Perchlorate**

To date, the City has pumped approximately 500,000,000 gallons of contaminated water from the Tennant Well. The perchlorate removal system at that location has removed approximately 53 pounds of perchlorate from the aquifer. That means that there is 53 pounds less perchlorate in the Basin, there is 53 pounds less perchlorate moving southward to impact the rest of the Basin, and 53 pounds less perchlorate that Olin has to remediate.

There has been no indication that the operation of the Tennant Well is in any way hampering Olin's on site clean up. Likewise, despite Olin's suggestions before the Tennant Well's return to operation, there is no demonstrable effect it is having on Olin's plans for remediation. Of course, the one impact Olin never mentions is that there is less perchlorate to remove from the Basin south of the Tennant Well.

## **3. Costs to the City of Removing Olin's Perchlorate**

As the RWQCB knows, the Santa Clara Valley Water District has graciously paid for the rental and other related costs for the perchlorate removal system for two years. Notwithstanding that, the City has spent almost \$300,000 of rate payer funds on system permitting, operation and maintenance. It expects that the annual cost of O&M and rental on the equipment will be on the order of \$135,000 per year. The number of years that this facility will remain on line is not yet established, but given the general magnitude and concentration of the plume in this location, it is certainly within the realm of reason that a further decade of operation is not out of the question. Assuming this to be the case, the ratepayers of the City would be paying well over \$1,350,000 to remove Olin's perchlorate from the aquifer.

## **4. Basis for Request**

Water Code § 13304(a) permits the RWQCB to order Olin to "clean up the waste or abate the effects of the waste...and take other necessary remedial action, including, but not limited to, overseeing cleanup and abatement efforts." The RWQCB has done so by issuing the CAO.

The CAO issued in this matter supports State Board Resolution 68-16. It states in pertinent:

"Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed."

The RWQCB has found, as referenced in the CAO that Olin's perchlorate "degraded high quality waters of the state in violation of this objective." (Paragraphs 5, 33). Further, the CAO supports State Board Resolution 92-49. Resolution 92-49 requires that the RWQCB to "implement" procedures to:

"...ensure that dischargers shall have the opportunity to select cost-effective methods for detecting discharges or threatened discharges and methods for cleaning up or abating the effects thereof..."

The operation of the Tennant Well is satisfying the requirements of the CAO and the State Board. It is remediating perchlorate from the Basin south of the Olin Site. It is doing so in a remarkably cost effective manner that is consistent with the retention of groundwater quality to the maximum benefit of the people of this State. However, it is patently inequitable for the ratepayers of the City to bear this cost. In the RWQCB's letter of October 6, 2006, there was an obvious desire by the RWQCB to have Olin start remediation in Area 1, directly south of the Tennant Well. The RWQCB stated:

"We agree that continued plume characterization is necessary and appropriate to fully characterize the extent and degree of groundwater impacts within the highest concentration area (Area I), particularly with the deep aquifer zone. However, we do not agree that it is premature to select and implement a specific remedial alternative for Area I."

This same letter concludes:

"Expedient plume migration control and groundwater cleanup are extremely important. Our intent is to continue working with you and all interested parties closely to continue plume characterization and to expedite active remediation."

Ms. Lori Okun  
May 22, 2007  
Page 4

To date, Olin has not remediated any part of the Basin except their own site. The City's Tennant Well has, and will continue to do so, while Olin studies and writes reports; but takes no action. The only real remediation that has gone on, and continues to go on in the Basin is the Tennant Well. It should be recognized as part of the remedy and should, therefore, be the fiscal responsibility of Olin.

Very truly yours,



Steven L. Hoch  
For HATCH & PARENT  
A Law Corporation

cc: Mr. Ed Tewes  
Mr. Jim Ashcraft  
Ms. Janet Kern  
Mr. Harvey Packard

## **PETITION EXHIBIT 12**



Linda S. Adams  
Secretary for  
Environmental Protection

## State Water Resources Control Board

### Office of Chief Counsel

1001 I Street • Sacramento, California 95814 • (916) 341-5150  
Mailing Address: P.O. Box 100 • Sacramento, California • 95812-0100  
FAX (916) 341-5199 • <http://www.waterboards.ca.gov>



Arnold Schwarzenegger  
Governor

June 29, 2007

Steven L. Hoch  
Attorney At Law  
Hatch & Parent, A Law Corporation  
11911 San Vicente Boulevard, Suite 350  
Los Angeles, CA 90049

Dear Mr. Hoch:

**OLIN CORPORATION, 425 TENNANT AVENUE, MORGAN HILL, SANTA CLARA COUNTY**

This letter responds to your letter of May 22, 2007 and your email of June 21, 2007.

On behalf of the City of Morgan Hill (City), your May 22 letter requested that the operation of the Tennant Avenue Well be included in Olin Corporation's cleanup plan in response to CAO No. R3-2006-0112. The Central Coast Regional Water Quality Control Board (Water Board) cannot "specify the design, location, type of construction, or particular manner in which compliance may be had" with the CAO, and Olin may "comply with the order in any lawful manner." (Ca. Wat. Code § 13360.) Although an order does not violate Section 13360 merely because there is only one feasible means of compliance (*Tahoe-Sierra Preservation Council v. State Water Resources Control Bd.* (1989) 210 Cal.App.3d 1421, 1438; *Pacific Water Conditioning Ass'n, Inc. v. City Council of City of Riverside* (1977) 73 Cal.App.3d 546, 554), staff has not concluded that operating the wellhead treatment system at the Tennant Avenue Well or an equivalent action is necessary to comply with the CAO or Resolution No. 92-49, either as an interim or final measure.

If Olin chooses to propose the continued operation of the wellhead treatment system as part of its remediation strategy, Water Board staff will consider that proposal when reviewing the overall cleanup strategy. If Olin does not propose this, staff will consider what added benefits the wellhead treatment could provide (e.g., faster cleanup, improved plume containment) when considering Olin's selected groundwater cleanup remedy. If wellhead treatment at the Tennant Avenue Well is part of Olin's cleanup activities, Olin and the City will have to work out any issues related to Olin's access to the wellhead treatment system and/or arrange for payment of associated costs.

California Environmental Protection Agency

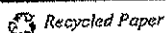


EXHIBIT 6

PET EXHIBIT 12

June 29, 2007

At this time, Water Board staff cannot determine whether operation of the Tennant Avenue Well provides hydrogeologic containment of the plume that would otherwise not be provided by the recently proposed Area I extraction wells.

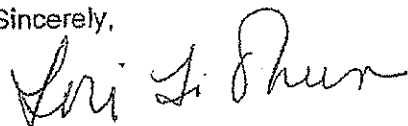
Olin's position is that the Tennant Avenue Well will not provide additional containment of the plume that the proposed Area I extraction wells will not. (See, Response to Comment #2 and Fig. 2-3 in Mactec's March 9, 2007 report addressing the Water Board's January 8, 2007 letter.) Water Board technical staff requires field data from the proposed extraction wells to confirm this. The City may have drawn perchlorate into the deeper aquifer(s) by running the Tennant Avenue Well; if so, continued operation of the well might help to contain the plume. As you point out, the Tennant Avenue Well has removed a large amount of perchlorate so we encourage the City to continue well operation.

Your letter suggests that the City must operate the Tennant Avenue Well to compensate for lost wells in other parts of the system. As you know, the Water Board cannot require Olin to provide replacement water for any wells with perchlorate concentrations at or below 6 µg/L. (State Water Board Order No. WQO-2005-0007.) Nor can the Water Board require Olin to replace the Tennant Avenue Well, because Olin has already done so by paying for installation of the San Pedro well.

In your June 21 email, you asked for the status of obtaining Olin's input data for groundwater modeling. Water Board staff has found a Department of Toxic Substances Control employee with experience in numerical modeling who will evaluate whether the groundwater model assumptions and output are valid and reasonable. Central Coast Water Board staff has also requested that Olin provide the electronic input files in our letter dated June 28, 2007. The electronic input files should be available to the public on August 3, 2007, in accordance with our June 28, 2007 letter.

The Water Board will provide the City with additional information as it becomes available.

Sincerely,




Lori T. Okun  
Senior Staff Counsel  
Office of Chief Counsel

cc: Olin IPL  
Enclosures

s:\seniors\shared\site cleanup program\regulated sites\santa clara cololin corp\morgan hill - komex\lagas  
subbasin\2007\steven l hoch 6.26.07 hp.doc

*California Environmental Protection Agency*

 Recycled Paper





March 9, 2007

Mr. Hector Hernandez  
Regional Water Quality Control Board, Central Coast Region  
895 Aerovista Place, Suite 101  
San Luis Obispo, California 93401

Subject: Olin Response to Central Coast Water Board Comments  
SLIC: 425 Tennant Ave, Morgan Hill  
Second and Third Quarter 2006 Groundwater Monitoring Reports,  
and East of Site Characterization Report  
MACTEC Project No. 6100070002-09.07

Dear Mr. Hernandez:

On behalf of Olin Corporation (Olin), MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this letter response to comments presented in the Central Coast Regional Water Quality Control Board's (Water Board's) January 8, 2007 letter regarding the following reports:

- July 30, 2006 *Second Quarter 2006 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California* (2Q Monitoring Report)
- October 30, 2006 *Third Quarter 2006 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California* (3Q Monitoring Report)
- September 29, 2006 *East of Site Characterization, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California* (East of Site Report).

Water Board comments pertaining to the *Third Quarter 2006 On-Site Remediation Performance Monitoring Report (GeoSynitec)* will be addressed by GeoSynitec and submitted separately. The Water Board's comments pertaining to the MACTEC reports are reproduced below, followed by MACTEC's responses.

#### 2Q AND 3Q MONITORING REPORTS

##### **1. Revised Monitoring and Reporting Program**

No response necessary.

## 2. Continued Monitoring of Groundwater Elevations

Comment 1. Provide an update on the results of the continuous groundwater elevation monitoring in well in the next quarterly monitoring report.

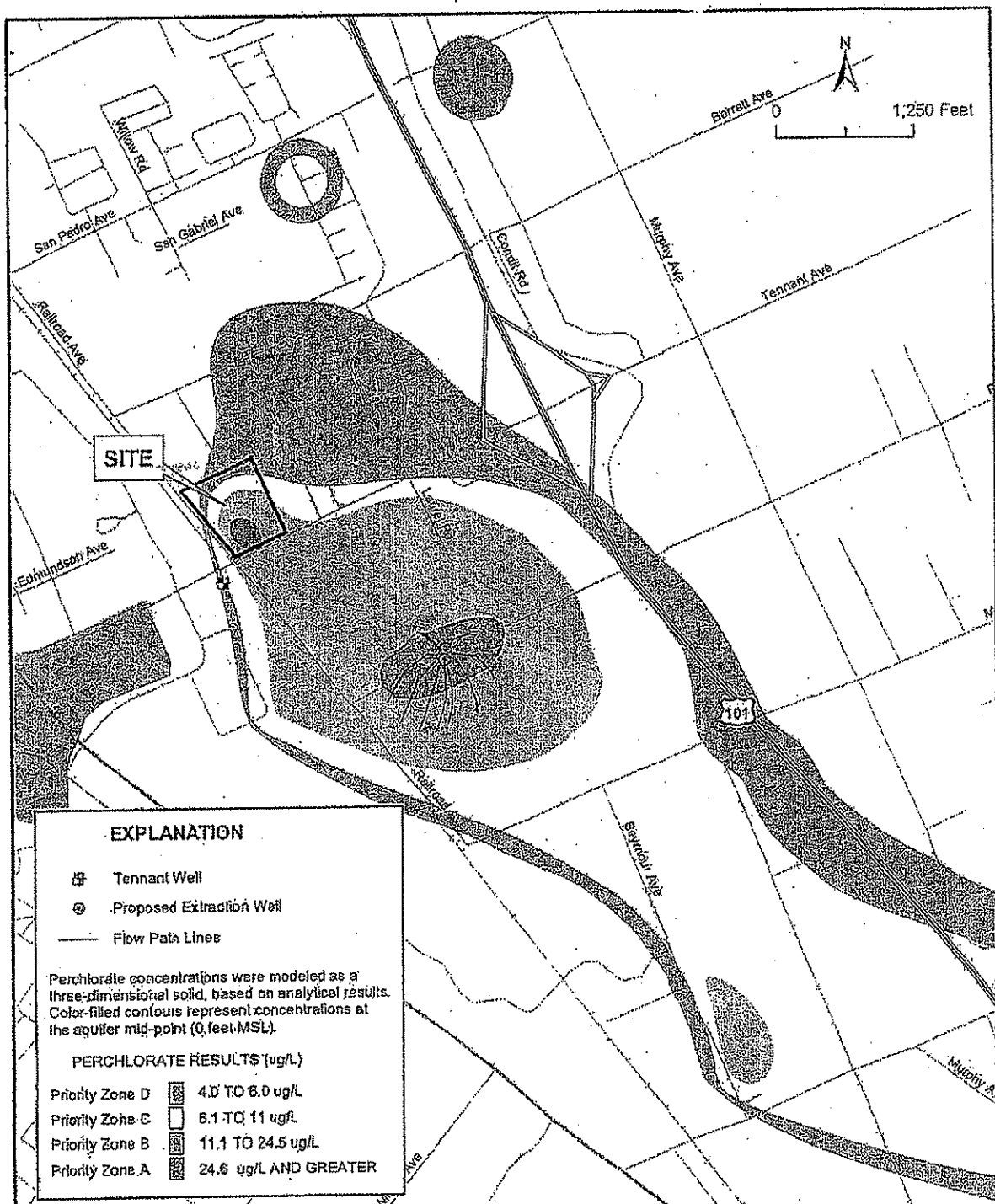
Response: Agreed.

Comment 2. Provide an analysis of how the Tennant Well pumping affects perchlorate distribution and capture zones in the intermediate and deep aquifer zones. The analysis should evaluate if the Tennant Well is pulling the perchlorate plume downward, and to what extent the Tennant Well is providing hydraulic containment of the perchlorate plume in the intermediate and deep aquifer.

Response: In a letter dated May 13, 2003, Olin Corporation stated that operation of the Tennant Well should not resume because of concerns regarding the potential for downward migration of perchlorate into the deep aquifer. Despite these concerns, the City of Morgan Hill elected to resume pumping and perchlorate concentrations have and continue to increase at MW-04C and MW-05C.

Time-concentration plots for deep monitoring wells MW-04, MW-05, and MW-06 prior and subsequent to the November 2004 restart of the Tennant Well are illustrated on Figure 1. These data illustrate that, while an increase in perchlorate concentrations at well MW-06C did not occur until well after the resumption of Tennant Well pumping, subsequent increases in concentration at wells MW-04C and -05C were immediate. These perchlorate concentration increases in the deep aquifer appear to have been a direct result of Tennant Well operation. Where prior to operation of the Tennant Well perchlorate concentrations were primarily less than the 6 µg/L PHG, perchlorate concentrations increased subsequent to operations and appear to have followed an increasing trend. Based on the increasing trend in concentrations at these two wells, continued operation of the Tennant Well is likely to result in concentrations higher yet in the deep aquifer beneath the Site. As a result, continued operation of the Tennant Well is likely to address perchlorate concentration that, as a result of Tennant Well operation, now exceed the PHG.

As reported in the *Area I Plume Migration Control Feasibility Study* (GeoSyntec, 2007), one extraction well is proposed for deep aquifer hydraulic containment of perchlorate within Assessment Area I. The numerical simulations referenced in this report include continuous operation of the Tennant Well. At the request of the Water Board, the deep aquifer capture simulation was modified to illustrate the potential capture area of the proposed extraction well without the influence of pumping from the Tennant Well. Potential capture areas from the proposed extraction well with respect to the Tennant Well operation as both on and off are illustrated on Figures 2 and 3. As these figures illustrate, that very little change occurs in the capture area of the proposed deep extraction well whether the Tennant Well is on or off.



**MACTEC**

Capture Area of Proposed Deep Aquifer Extraction Well  
Tennant Well On  
Response to Central Coast Water Board Comments  
Olin/Standard Fusee Site  
Morgan Hill, California

FIGURE

**2**

DRAWN  
GFA

JOB NUMBER  
6100070002 09.07

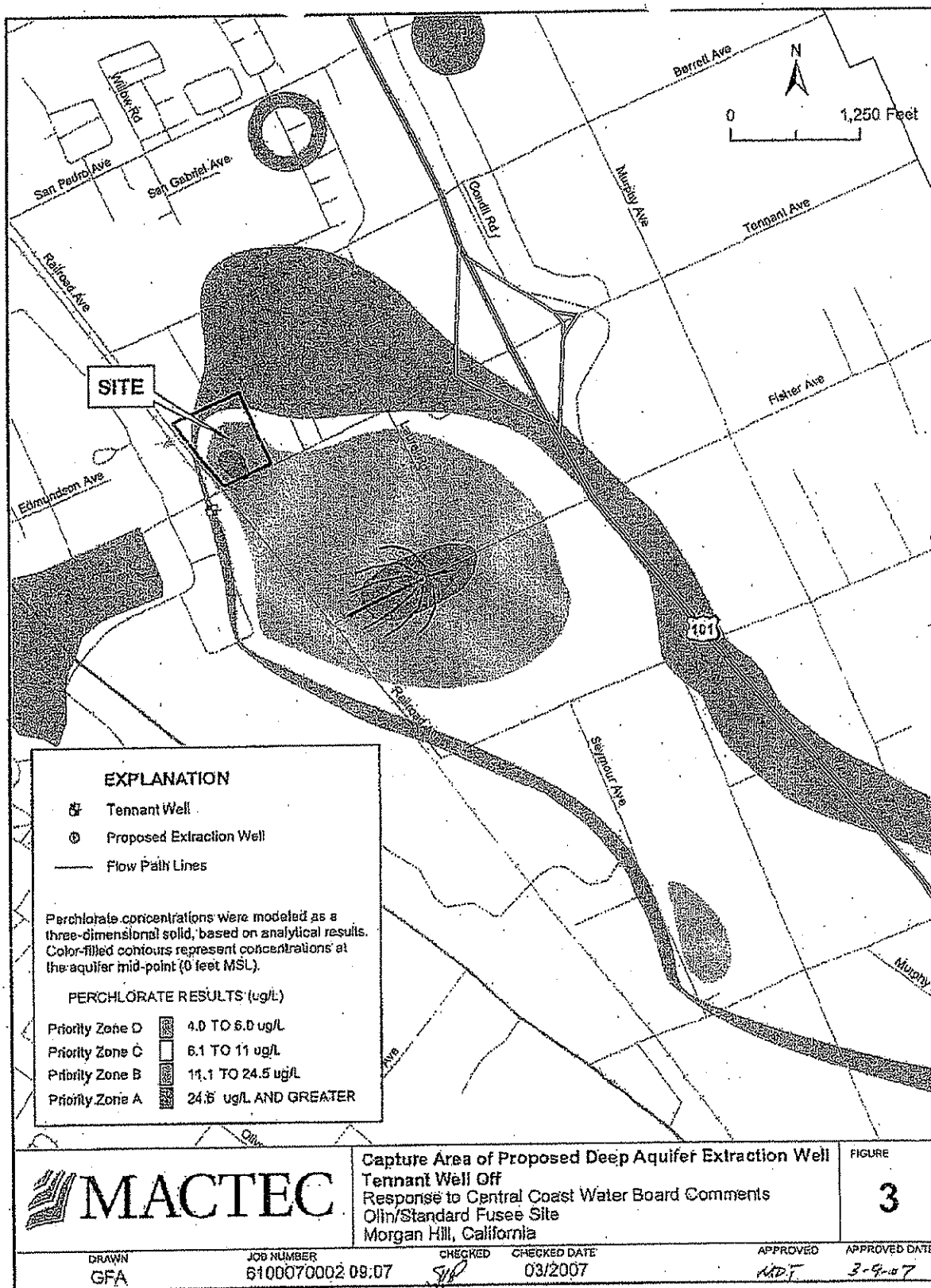
CHECKED  
SLP

CHECKED DATE  
03/2007

APPROVED  
MCT

APPROVED DATE  
3-9-07

Figure2.mxd, 62-09-07



## **PETITION EXHIBIT 13**

11911 San Vicente Boulevard, Suite 350  
Los Angeles, CA 90049  
Telephone: (310) 440-9996  
Fax: (310) 440-9961



Steven L. Hoch

Direct Dial: (310) 440-5081  
SHoch@HatchParent.com

October 30, 2003

Mr. Harvey Packard  
California Regional Water Quality Control Board  
Central Coast Region  
895 Aerovista Place, Suite 101  
San Luis Obispo, CA 93401

Re: Olin Site - Tennant Well Pumping

Dear Mr. Packard:

Komex has performed a program of test pumping, downhole testing, and discrete-depth sampling of the Tennant Well in the City of Morgan Hill ("City").

The purpose of the investigation was to assess the current condition of the well, determine whether perchlorate is still present in water pumped from the Tennant Well, and determine whether discrete water-bearing zones might be preferential pathways of perchlorate migration into the well. During the testing the following downhole testing was performed: dynamic flow temperature logging, dynamic flow resistivity logging, dynamic flow spinner logging and discrete-depth water sampling. On August 1, 2003, the following downhole testing was performed: video logging, ambient temperature logging, ambient resistivity logging and ambient heat-pulse flow logging.

Further, the data collected strongly suggests that perchlorate is present at low concentrations throughout the lower aquifer adjacent to the screened zone. The strong vertical gradient in the absence of the Tennant Well pumping suggests a longstanding potential for downward migration of perchlorate pre-dating the operation of the Tennant Well beginning in 1979. This data certainly suggests additional on-site and off-site monitoring wells to characterize the lower zone below 200 ft bgs are warranted.

LA 3914 v1: 010371.0001

Mr. Harvey Packard  
October 30, 2003  
Page 2

Based on the results of the testing it appears that perchlorate is entering the Tennant Well in approximately equivalent concentrations from all significant water-producing zones within the screened interval, or that water from different zones may be mixing in the filter pack and yielding equivalent concentrations at all depths within the well. Downhole testing indicates that very little water enters the well casing from depths greater than approximately 320 feet below the top of the casing. Calculated concentrations of perchlorate in pore water just outside of the well casing in all water-producing zones are generally just slightly lower than the PQL of 4.0 ug/L. A copy of the full and complete report is enclosed.

The Regional Water Quality Control Board (RWQCB) authored a letter to Olin dated May 13, 2003 in which stated, in pertinent part:

"The extraction and treatment of perchlorate contaminated water from the Tennant Avenue well will reduce the mass of perchlorate leaving the area and will provide partial hydraulic containment of the plume within the well's area of influence."

Olin wrote to the RWQCB on May 13, 2003 regarding the Tennant Well and stated in pertinent part:

"Testing such technology (ion exchange) at the Tennant Avenue well may, in fact, cause migration of perchlorate into currently clean groundwater and unnecessarily complicate on-site remediation."

Without reference to what Olin meant as to "testing such technology," we believe, based on the test results enclosed herein, that operating this well will accomplish what the RWQCB has stated it is desirous of doing, i.e. removing the mass of perchlorate that continues to impact the groundwater.

We have discussed this matter with the City of Gilroy and the Santa Clara Valley Water District. Both are in support of the operation of the system.

We request, therefore, that the RWQCB do the following:

1. Meet with the City and its technical representatives to discuss the RWQCB's comments, if any, on the report;

Mr. Harvey Packard  
October 30, 2003  
Page 3

2. Establish whether the RWQCB has any requests concerning the perimeters of operation for the perchlorate treatment system and obtain from the RWQCB its written concurrence concerning the operation of the system based on the perimeters agreed to.

As always, the City would be happy to meet directly with Olin and/or its technical representatives on this matter. We have consistently supported such direct technical discussions and will continue to do so. In order to facilitate such discussions, under separate cover a copy of this letter and a copy of the report will be sent to counsel for Olin.

Very truly yours,



Steven L. Hoch  
For HATCH & PARENT  
A Law Corporation

Enclosures

cc: Mr. Ed Tewes w/enclosure  
Ms. Helene Leichter w/enclosure  
Mr. Jim Ashcraft w/enclosure  
Mr. Jon Rohrer w/out enclosure



## **PETITION EXHIBIT 14**



# California Regional Water Quality Control Board

## Central Coast Region



Terry Tamminen  
Secretary for  
Environmental  
Protection

Internet Address: <http://www.swrcb.ca.gov/rwqcb3>  
895 Aerovista Place, Suite 101, San Luis Obispo, California 93401  
Phone (805) 549-3147 • FAX (805) 543-0397

Arnold Schwarzenegger  
Governor

August 17, 2004

Mr. Curt M. Richards  
Olin Corporation  
Vice President  
Environment, Health & Safety  
PO Box 248  
Charleston, TN 37310-0248

Dear Mr. Richards:

SLIC: 425 TENNANT AVENUE, MORGAN HILL; JUNE 21<sup>ST</sup> TENNANT WELL  
RESPONSE LETTER FROM CURT RICHARDS DATED JUNE 21, 2004

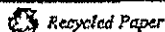
Regional Board staff have reviewed your response to our second Tennant well request letter, dated May 19, 2004. We requested additional technical justification to support your position that the Tennant well not be pumped because of the possibility of drawing perchlorate into deeper "clean" aquifer zones and the potential for impacts to your onsite groundwater containment and treatment system.

In our opinion, your technical response does not substantiate your claims of potential impacts to your onsite groundwater containment and treatment system. While a limited groundwater data set has been emailed to our office, you have not demonstrated that the existing groundwater containment system would be incapable of hydraulic containment during Tennant well operation. As you are aware, our November 18, 2003 letter directs Olin to consider and evaluate the influence of Tennant well operation, pumping at 470 gallons per minute, on groundwater containment system performance.

As we have stated in previous letters, we do not believe your assertions have been supported by your technical data analysis. Based on our review, we conclude it is unlikely that pumping the Tennant well will draw perchlorate into the deeper aquifer zones. We have reached this conclusion based on (1) the length of time the Tennant well has operated prior to being shut down and the corresponding lack of perchlorate in deeper aquifer zones, (2) Olin's previous offer to the City of Morgan Hill to install ion exchange treatment which indicates your level of concern, and (3) your technical analysis does not support any contrary conclusion.

As we understand, the City of Morgan Hill (City) regularly tests its drinking supply wells for perchlorate. Recently, the San Pedro well tested at 4 ppb for perchlorate. The San Pedro replaced the Tennant well and was paid for by Olin. The City is very concerned with this recent development, which has the potential to further complicate their water supply needs. Based on the above-mentioned information, we have sent the City a letter conditionally informing them we do not object to Tennant well operation. We have attached this letter for your information.

California Environmental Protection Agency



Item No.10 Attachment No. 2  
September 10, 2004 Meeting  
Perchlorate Sites

EXHIBIT 9

PET. EXHIBIT 14

August 17, 2004

Should the City decide to operate the Tennant well, we request that you carefully monitor your groundwater containment system for signs of adverse impact. Results of this monitoring shall be submitted as part of your Quarterly On-Site Groundwater Containment & Perchlorate Removal System Performance and Discharge Monitoring Reports. If the appropriate data are collected and a technical analysis demonstrates that the Tennant well does adversely affect either your groundwater containment and treatment system or the deeper aquifer system, we require that you inform us immediately by telephone or email, and submit that information to us in writing no longer than 30 days after you make your determination. The information you submit shall be in report format and contain, at a minimum:

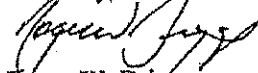
- Data supporting your claims, including groundwater elevation and quality
- A technical analysis and discussion demonstrating why the groundwater system containment system is no longer capable of hydraulic containment
- Your plans to modify your system to re-establish hydraulic containment
- Report certification and signature by a Registered Civil Engineer or Geologist, Certified Engineering Geologist

We believe it is important for you and the City of Morgan Hill to work together closely on this matter to ensure necessary water supply and protect the aquifer. We have asked the City to notify you prior to Tennant well operation. This notification will enable you to closely monitor your system and quickly identify any problems. Additionally, the city has agreed to operate the Tennant Well on a continual basis. We believe this will assist you in determining if impacts are occurring and enable you to quickly formulate a response. Based on the City's critical water supply needs and our analysis of your technical information, we believe this is the only way to resolve this issue. We will consider any additional technical information you may have to support your claims.

You are required to provide the above-requested information no longer than 30 days after you determine hydraulic containment has been compromised. We request submittal of the status reports pursuant to Section 13267 of the California Water Code. The reason the Regional Board needs the status reports is to ensure appropriate and timely reporting of the investigation and remedial activities at and in the vicinity of the subject site. The evidence that supports requiring Olin Corporation to provide the status reports is that Olin owns the site and previously operated the flare manufacturing facility. More detailed information is available in the Regional Board's public file on this matter.

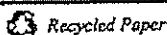
Any person affected by this requirement may petition the State Water Resources Control Board to review the action in accordance with Section 13320 of the California Water Code and Title 23, California Code of Regulations, Section 2050. The State Board must receive the petition within 30 days of the date of this order. Copies of the law and regulations applicable to filing petitions will be provided upon request. Should you have any questions, please contact David Athey at (805) 542-4644 or Eric Gobler at (805) 549-3467.

Sincerely,



Roger W. Briggs  
Executive Officer

*California Environmental Protection Agency*



August 17, 2004

Enclosure: Letter to Mr. Ed Tewes, City of Morgan Hill

cc via E-mail:

Ms. Lori Okun  
Office of the Chief Counsel  
State Water Resources Control Board

Mr. Jim Ashcraft  
City of Morgan Hill

Mr. Rich Chandler  
Komex

Mr. Peter Forest  
San Martin County Water

U.S. Environmental Protection Agency

Mr. Steven L. Hoch  
Hatch & Parent

Ms. Sylvia Hamilton  
PCAG

Mr. Tom Mohr  
Santa Clara Valley Water District

PCAG Members

Elected Officials

cc via U.S. Mail:

Mr. Jay Baska  
City of Gilroy  
7351 Rosanna Street  
Gilroy, CA 95020-6197

Mr. Eric Lacy  
CA Dept. of Health Services  
2151 Berkeley Way  
Berkeley, CA 94704-1011

Ms. Helene Leichter  
City of Morgan Hill  
17555 Peak Avenue  
Morgan Hill, CA 95037

Mr. Eugene Leung  
CA Dept. of Health Services  
2151 Berkeley Way  
Berkeley, CA 94704-1011

Mr. Richard Peekema  
4817 Wellington Park Dr.  
San Jose, CA 95136

Ms. Suzanne Muzzio  
Santa Clara Co. Env. Health Services  
1555 Berger Drive, Suite 300  
San Jose, CA 95112-2716

Mr. Keith M. Casto  
Sedgwick, Detert, Moran & Arnold  
One Embarcadero, 16th Floor  
San Francisco, CA 94111-3628

Mr. Joe Root, General Manager  
Corde Valle  
One Corde Valle Club Drive  
San Martin, CA 95046

Mr. Rob Stern  
7510 Kenbrook Place  
Suwanee, GA 30024

Mr. Richard W. McClure  
Olin Corporation  
Environmental Remediation Group PO  
Box 248  
Charleston, TN 37310-0248

Mr. Jay McLaughlin  
President and CEO  
Standard Fussee Corporation  
PO Box 1047  
Easton, MD 21601

S:\SLIC\Regulated Sites\Santa Clara Co\Olin\OLIN-425 TENNANT AVENUE\COMMUNICATIONS - RICK MCCLURE\2004  
Letters\Responses\June21\tennantwellletter.doc

*California Environmental Protection Agency*



## **PETITION EXHIBIT 15**



## California Regional Water Quality Control Board Central Coast Region

Internet Address: <http://www.waterboards.ca.gov/centralcoast>  
895 Aerovista Place, Suite 101, San Luis Obispo, California 93401  
Phone (805) 549-3147 • FAX (805) 543-0397



Arnold Schwarzenegger  
Governor

*Miked*

April 26, 2006

Mr. Richard W. McClure  
Olin Corporation  
Environmental Remediation Group  
P.O. Box 248  
Charleston, TN 37310-0248

Dear Mr. McClure:

**SLIC: 425 TENNANT AVE, MORGAN HILL; FORMER OLIN FACILITY, PLUME  
MIGRATION CONTROL ASSESSMENT REPORT FOR THE LLAGAS SUBBASIN**

We have reviewed the March 3, 2006 *Plume Migration Control Assessment Report for the Llagas Subbasin, Former Olin/Standard Fusee Site, Santa Clara County, California* (Assessment Report), prepared for Olin Corporation by MACTEC Engineering and Consulting, Inc. The Assessment Report was provided in accordance with Cleanup or Abatement Order R3-2005-0014 (Cleanup Order) issued on March 10, 2005. The Cleanup Order (Ordering Paragraph E) requires Olin to develop a Plume Migration Control Assessment Report that evaluates whether groundwater plume cutoff is necessary.

The Assessment Report provides a preliminary assessment on the potential need to control the migration of perchlorate in groundwater south of the Olin site. The assessment focused on perchlorate detections in off-site groundwater wells, groundwater flow directions, and a concentration trend analysis over time. The report indicates that the distribution of perchlorate in groundwater was evaluated with respect to four geographical areas (Areas I, II, III, and IV) correlative with current and historical perchlorate concentrations, number of occurrences, and frequency of detections above the California Office of Environmental Health Hazard Assessment (OEHA) public health goal (PHG), south of the Site.

The results of two complete years of quarterly groundwater monitoring of several hundred wells throughout the Llagas Subbasin (First Quarter 2004 through Fourth Quarter 2005) appear to show a decreasing trend in perchlorate concentrations. The number of wells with concentrations exceeding the PHG of 6 micrograms per liter ( $\mu\text{g/L}$ ), during the two-year monitoring period has decreased from 199 to 31 wells, an 85 percent reduction. The decreasing trend in wells with perchlorate detections is primarily observed in Areas II, III, and IV. However, perchlorate detections within Area I have

California Environmental Protection Agency

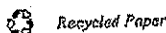


EXHIBIT 13

PET

EXHIBIT 15

April 26, 2006

remained relatively stable over the last two years of monitoring. Area I extends from the Site to just south of Middle Avenue west of Highway 101 and includes the area with the highest perchlorate concentrations.

According to the Assessment Report, the observed decreasing perchlorate concentration trends within Areas II, III, and IV may be attributed to the operation of several percolation ponds near Morgan Hill and intermittent pumping and discharge from hundreds of active agricultural, domestic and municipal wells at various depths within the Subbasin. Olin postulates that these hydraulic mechanisms may induce dilution by increasing the mechanical dispersion (i.e., mixing) of the dissolved constituents with recharge water within the aquifer zones resulting in declining temporal and spatial concentration trends within the Llagas Subbasin.

According to the Assessment Report, the assessment required by the Cleanup Order (Ordering Paragraph E) has not been finalized because much of the necessary and pertinent information required for complete analyses is anticipated in several upcoming submittals, including elements of the economic and technological feasibility analyses in the *Llagas Subbasin Cleanup Feasibility Study* (due June 30, 2006) (Cleanup Feasibility Study). Elements of the additional hydrogeologic data and additional investigation activities deemed necessary for complete analyses are addressed specifically in the March 30, 2006 *Llagas Subbasin Characterization Report* (Characterization Report).

The Assessment Report makes the following conclusions:

- Migration control measures may be appropriate for Area I, located immediately south of the Site.
- Off-site investigation activities are incomplete, particularly in within Area I. Thus, it is premature to make conclusions or recommendations regarding the potential need for plume migration control pending the results of the ongoing investigations.
- Based on the decreasing to stable trends over time, migration control measures will likely not be necessary in Areas II, III, and IV, at this time.
- The scope of the Cleanup Feasibility Study will include an evaluation of potential remedial actions that may be necessary.

We agree with the report conclusions and recommendations concerning the need for additional assessment activities prior to recommending specific plume migration control measures. We are also in general agreement that based on the existing declining trends in perchlorate concentrations, plume migration control measures may not be required within Areas II, III, and IV at this time. However, considering the stable and persistent groundwater impacts within Area I, we strongly believe additional groundwater hydraulic control measures are appropriate and necessary to effectively control further migration of the perchlorate plume within Area I.

According to the Cleanup Order (Ordering Paragraph E), if the Discharger or the Executive Officer concludes that plume migration control is required, then the



April 26, 2006

Discharger shall submit a **Plume Migration Control Feasibility Study**, which addresses the elements outlined in Ordering Paragraph F, and as paraphrased below:

1. Evaluate alternatives for plume migration control to prevent perchlorate migration toward the City of Gilroy or other aquifer zones that are not impacted by perchlorate.
2. Provide a time estimate for establishing plume migration control for each alternative evaluated. Include a time schedule for implementation of each alternative evaluated and select one or more alternatives as the preferred alternative(s).
3. Perform an evaluation to determine potential adverse impacts to existing surface or groundwater beneficial uses that may be caused by the proposed migration control strategy.
4. Submit a Plume Cutoff and Remediation Work Plan 60 days after Executive Officer approval of the Plume Migration Control Feasibility Study.

We take this opportunity to point out the different objectives of Cleanup Order requirements contained in Ordering Paragraph F (Plume Migration Control Feasibility Study) and Ordering Paragraph J (Cleanup Feasibility Study). The objective behind Ordering Paragraph F is to effectively control the spread of perchlorate-impacted groundwater, horizontally and vertically. According to Ordering Paragraph F, if the Discharger or the Executive Officer determines that plume cutoff is necessary, the Discharger must evaluate alternatives for implementing appropriate and effective plume migration control measure(s). Alternatively, the primary objective behind Ordering Paragraph J is groundwater cleanup. Ordering Paragraph J requires the Discharger to evaluate the feasibility of long-term basin-wide groundwater cleanup. As you can appreciate, the objective of each of these Cleanup Order Ordering Paragraphs requirements is quite different.

We point out these differences primarily because the Assessment Report seems to imply that, based on the results of ongoing data evaluations and the additional site-specific data needs described in the recent Characterization Report, plume migration control may be deemed unnecessary within Area I. However, we believe that plume migration control within Area I is necessary and required. We do not believe the additional assessment data will change the need for plume migration control within Area I.

However, as discussed above, we agree with the Assessment Report's contention that the additional data needs described in the March 30, 2006 Characterization Report will provide better understanding of groundwater conditions within the Llagas Subbasin, particularly in Area I. We expect the additional data will provide valuable information concerning the vertical and horizontal extent and degree of perchlorate impacts within Area I. While the additional assessment data will be valuable in the ongoing evaluation of groundwater cleanup alternatives and the establishment of an appropriate groundwater cleanup level for perchlorate, it will also be essential in the appropriate design and location (target zones) of the plume migration control alternative(s) to be selected.





April 25, 2006

Consequently, we agree with the Assessment Report's recommendation to provide a final assessment of the need for migration control measures in the forthcoming Cleanup Feasibility Study submittal. The additional assessment data and evaluation results shall be considered as an addendum to the Assessment Report and must be included in a separate section of the Cleanup Feasibility Study submittal (i.e., "Plume Migration Control Assessment Report - Addendum"). To the extent that the collection and evaluation of the additional data needs described in the March 30, 2006 Characterization Report are complete, the Assessment Report addendum shall address the elements outlined in Ordering Paragraph F (paraphrased above). As you know, in accordance with Ordering Paragraph F of the Cleanup Order, you are required to prepare and submit a *Plume Migration Control Feasibility Study* within 60 days following Executive Officer approval of the Assessment Report. Thus, unless convincing information is presented that contradicts our contention that migration control measures are necessary, we expect the Assessment Report addendum will propose submittal of the Plume Migration Control Feasibility Study.

On a related matter, during a recent discussion with City of Morgan Hill staff, it came to our attention the City of Morgan Hill is interested in purchasing an approximately 60-acre parcel immediately south of the former Olin Facility that would be utilized as a drainage basin. City staff indicated the City would consider partnering with Olin to purchase and share use of the property. We strongly encourage Olin to consider pursuing the possibility of negotiating an agreement with the City of Morgan Hill. As discussed above, we believe the implementation of plume migration control measures will likely be required within Area I. With this in mind, it is also highly probable that Olin would require a large parcel to install and operate an effective and extensive groundwater pump and treat well field. We believe the terms of such an agreement may prove beneficial to both parties, the community, and long term water quality.

**Specific Comments:**

1. Section 1.3, Plume Definition, First Paragraph states, "Olin's evaluation of several perchlorate sources will be included in the Llagas Characterization Report. The data utilized in this assessment present perchlorate detections in the Llagas Subbasin and include data that may not necessarily be related to the Olin Site."

**Comment:** While we generally agree with this statement, until other sources of perchlorate are confirmed, we must assume that the vast majority of the perchlorate detected, particularly south of the Site, is related to the Olin Site.

2. Section 1.3, Plume Definition, Second Paragraph states, "the cleanup level for the Llagas Subbasin that will be developed and presented in the Feasibility Study will consider background, the preliminary 11 ug/L concentration proposed in Olin's Cleanup Level Report, the 24.5 ug/L preliminary remediation goal (PRG) recently promulgated by the USEPA, and other social and economic factors as required in State Board Resolution 92-49."



April 26, 2006

**Comment:** For clarification purposes, the following is an explanation of our understanding of Olin's cleanup responsibilities, the required cleanup process pursuant to Resolution 92-49, and our expectations in relation to the forthcoming Cleanup Feasibility Study.

Resolution No. 92-49 presumes cleanup to background. If Olin finds, and the Water Board agrees, that cleanup to background is not technologically or economically feasible, then Olin can produce an alternative cleanup level that protects actual and potential beneficial uses of surface and groundwater, is no higher than a level that is technologically and economically feasible, and which does not cause a hazard or a potential hazard to human health or the environment.

The alternative groundwater cleanup level may not, under any circumstances, exceed the level needed to protect the beneficial uses designated in the water quality control plan (Basin Plan). The alternative cleanup level may not be higher than the maximum concentration that would be allowed under other applicable statutes and regulations.

Further, in setting an alternative cleanup level, the policies in the State's non-degradation policy (Resolution No. 68-16) must also be considered. Resolution No. 68-16 must be applied to address groundwater remedial strategies that allow continued degradation of previously unaffected waters as plumes migrate and diffuse. Groundwater degradation includes areas where constituent concentrations exceed naturally occurring background but does not exceed the most restrictive numerical beneficial use standard. This consideration is particularly pertinent to the existing perchlorate plume emanating from the Olin facility. According to Resolution No. 68-16, the alternative cleanup level shall:

- Be consistent with maximum benefit to the people of the state;
- Not unreasonably affect present and anticipated beneficial use of such water; and
- Not result in water quality less than that prescribed in the Basin Plan and other State Policies.

In analyzing groundwater cleanup alternatives, the Cleanup Feasibility Study must include comparable alternatives that incorporate non-degradation policy elements (i.e., consideration of remediation to background levels). Overall project costs and time to achieve the standards must also be included. Considering a migrating groundwater plume, the Cleanup Feasibility Study must consider plume containment, or another form of control technology to prevent any portion of the plume, which exceeds the most protective beneficial use standard, from migrating. The plume containment element of the Cleanup Feasibility Study must be specifically addressed in the Assessment Report addendum and Plume Migration Control Feasibility Study.



Mr. Richard W. McClure


-6-

April 26, 2006

In summary, we hereby request submittal of an Assessment Report addendum, as described above. The Assessment Report addendum must include a thorough evaluation of any and all additional data collected in relation to the Assessment Report. We anticipate the majority of the additional assessment data will be collected, evaluated, and presented in the June 30, 2006 Cleanup Feasibility Study submittal. As discussed above, the additional data shall be provided in the form an addendum to the Assessment Report and shall be included as part of the June 30, 2006 Cleanup Feasibility Study submittal. We anticipate the additional assessment data will support the need to implementing plume migration control measures within Area I and will specifically propose submittal of a Plume Migration Control Feasibility Study.

We look forward to receiving the Cleanup Feasibility Study including the Assessment Report addendum. If you have any questions, please contact Hector Hernandez at: (805) 542-4641 or via e-mail at: [Hhernandez@waterboards.ca.gov](mailto:Hhernandez@waterboards.ca.gov), or Eric Gobler at (805) 549-3467.

Sincerely,

  
Roger W. Briggs  
Executive Officer

cc via E-mail:


Ms. Lori Okun  
Office of the Chief Counsel  
State Water Resources Control Board

cc via U.S. Mail:

Olin Correspondence IPL

S:\SLIC\Regulated Sites\Santa Clara Co\OLIN-425 TENNANT  
AVENUE\Water Board\Groundwater Cleanup\03\_03\_2006\_Plume Migration  
Control Assessment Report.doc

California Environmental Protection Agency

 Recycled Paper

## **PETITION EXHIBIT 16**

This Alternative is included for comparison of NFA with other proposed alternatives.

### **Detailed Analysis of Alternative**

Table 7.1 presents a detailed analysis of this alternative, including an assessment of overall protection of human health and the environment, compliance with regulatory requirements, long-term effectiveness and performance, reduction in toxicity, mobility or mass and/or volume of contaminant(s), short-term effectiveness, implementability, cost and stakeholder acceptance. Table 7.2 summarizes the results of scoring for the alternative relative to the other alternatives under consideration. Because perchlorate concentrations exceed the PHG in Priority Zone B, NFA is not acceptable.

## **7.3.2 Alternative 2 – MA for Priority Zone B**

### **Description of Alternative**

This alternative consists of routine groundwater monitoring activities to establish and confirm trends in declining perchlorate concentrations over time due to attenuation processes. The main monitored attenuation processes at Priority Zone B would consist of:

1. Reduction in mass in the source area due to ongoing remedial actions onsite and throughout the Subbasin, as well as proposed remedial actions in Priority Zone A.
2. Dilution and infiltration to the shallow aquifer due to percolation of precipitation.
3. Dilution/mixing due to imported water from the SCVWD's recharge ponds.
4. Continued irrigation with water from intermediate aquifer, coupled with reduction of perchlorate in intermediate aquifer (due to the reduced flux noted above) will result in a reduction of shallow aquifer concentrations.
5. Reduction in mass due to continued extraction from existing municipal and private supply wells.

2. Dilution and infiltration to the shallow aquifer due to percolation of precipitation.
3. Dilution/mixing due to imported water from the SCVWD's recharge ponds.
4. Continued irrigation with water from intermediate aquifer, coupled with reduction of perchlorate in intermediate aquifer (due to the reduced flux noted above), which will result in reduction in shallow aquifer concentrations.
5. Reduction in mass due to continued extraction from existing public and/or private supply wells.

For the purposes of evaluation, it is assumed that wells from the Monitoring Network located within Priority Zone C will be sampled for MA evaluation. The specific wells being monitored in the MRP would be evaluated and modified to accommodate the MA implementation. It is assumed that MA sampling would continue at a quarterly frequency for 5 years, semiannually for 5 years, and annually for 20 years thereafter. The overall duration of 30 years and actual number of wells used to monitor groundwater conditions will be refined upon completion of characterization activities and would be modified if the Monitoring Network is changed.

#### **Rationale for Assembly/Development of Alternative**

The MA alternative is included for the Priority Zone C, as groundwater remediation activities in Priority Zones A and B would reduce the perchlorate flux into this Priority Zone. Additional reduction in flux can be expected due to the other mechanisms noted in Section 7.3.2.

#### **Detailed Analysis of Alternative**

Hydraulic control and treatment of groundwater in Priority Zone A will make MA a feasible alternative for Priority Zone C. Projected times necessary to achieve cleanup goals by implementing Alternative 2 for Priority Zone C, coupled with hydraulic capture of Priority Zone A, are identical to projected times

# **PETITION EXHIBIT 17**



May 18, 2007

Proj. No.: H0562C  
File Loc.: Westminster

California Regional Water Quality Control Board  
Central Coast Region  
895 Aerovista Place, Suite 101  
San Luis Obispo, CA 93401

Attention: Mr. Hector Hernandez

Dear Mr. Hernandez:

**RE: REVIEW OF OLIN FOURTH QUARTER 2006 AND FIRST QUARTER 2007  
GROUNDWATER MONITORING REPORTS**

On behalf of the City of Morgan Hill (the City), WorleyParsons Komex has reviewed the Olin Corporation (Olin) January 30, 2007 report, "Fourth Quarter 2006, Groundwater Monitoring Report" (the Q4 Report) and the April 30, 2007 report "First Quarter 2007, Groundwater Monitoring Report" (the Q1 Report) for the Olin property at 425 Tennant Avenue, Morgan Hill, California (the Site) submitted to the Central Coast Regional Water Quality Control Board (RWQCB). Below, please find a summary of major comments on the reports, followed by additional detailed technical comments. For reader convenience, Report figures that are cited herein are included in Attachment A.

**FOURTH QUARTER 2006 GROUNDWATER MONITORING REPORT**

Although the Q4 Report no longer contains a separate appendix directed to the Northeast Flow area, our review focused primarily on the aspects of the Q4 Report that deal with groundwater flow and water quality in the area northeast of the Site. In particular, our review considered Appendix C (Transducer Data for Piezometers). Major comments on the Q4 Report are as follows:

- a) Groundwater flow directions within the Middle and Lower Deep Aquifer zones in third quarter 2006 in the vicinity of the Site were dominantly northerly-directed. This fact is finally acknowledged by Olin, in the statement on page 3-3 of the Q4 Report, "...groundwater flow in the middle- and deep- zones north of the Site flows to the north/northwest." As of fourth quarter 2006, there were six quarters of consecutive monitoring data (third quarter 2005 to fourth quarter 2006) showing a consistently northerly component of flow in the area northeast of the Site in the Deep Aquifer zone; however, for the first time, Olin has not provided a map of groundwater elevations in the Lower Deep Aquifer zone, as has been provided in previous quarterly monitoring reports. Although Olin provide data from the northeast triad of piezometers in Appendix C, there is almost no discussion of the results in the text. To make up for this deficiency a discussion of these data is provided herein;





- b) As in previous Olin groundwater monitoring reports, perchlorate results from on-Site, off-Site south and northeast are presented independently, without a single, integrated evaluation of groundwater perchlorate concentrations from the Site outward, both to the east and northeast, tying together all the data relevant to the migration from the Site to the City's northeast wells.
- c) Pumping of the City's northeast wells directly affects the groundwater flow direction and hydraulic gradient in the Deep Aquifer zone to the northeast of the Site. Pumping patterns in individual City wells are also reflected in the groundwater flow direction and gradient to the northeast of the Site.
- d) Pumping of the City's northeast wells effects the groundwater levels in the Deep Aquifer zone to the south extending beyond the Site. The observed drawdowns are greater than the natural head differences that would produce groundwater flow to the south.

## Fourth Quarter 2006 Report Detailed Comments

1. The direct hydraulic communication through the Deep Aquifer from the City's northeast wells to the Olin Site is illustrated by the Q4 trends in both the direction and magnitude of the hydraulic gradient in the northeast triad of monitoring wells, in response to pumping from the City's wells. The gradient direction and magnitude were calculated in the Middle Deep Aquifer zone by Olin for wells PZ-02-315, PZ-01-333 and PZ-03-325, and provided in the Q4 Report in Figure C9 of Appendix C. Figure C9 includes the period when the Nordstrom well ceased pumping for the year on November 6, 2006. The significance of this event on northeast groundwater flow warrants discussion. Q4 Report Figure C9 was modified by WorleyParsons Komex to highlight some of the key information relevant to the interpretation of the data, and is included in this document as Figure 1.

As shown in Figure 1, when all seven northeast wells were pumping (Diana #1,#2,#3, Dunne #1, #2, Nordstrom and Tenant) from October 1 to October 17, 2006, the groundwater flow direction was N40°W to N50°W (Note that N45°W corresponds to due northwest); the gradient during this pumping is high, at 0.004 to 0.006. The Diana #1 well is screened from 116 to 193 feet, exclusively in the Intermediate Aquifer zone, so presumably the Deep Aquifer zone response shown in Figure 1 reflects mainly pumping from the Dunne #1 and #2 and the Diana #2 and #3 wells. The Dunne #2 well was shut down for 15 days on October 17, 2006, and there was a corresponding shift in flow direction to the west by about five degrees, and a marked decrease in the hydraulic gradient to 0.0032 from 0.0043.

2. When the Nordstrom well was shut down on November 6, a major shift in the flow direction and gradient was observed. From November 6 to early December 2006, with Tenant, Diana #1, #2 and #3, and either Dunne #1 or #2 pumping, the gradient direction shifted west, ranging N60°W to N100°W (Note that N90°W corresponds to due west). The gradient during this period decreased appreciably, to about 0.002.
3. After December 7, 2006, both Dunne wells began pumping on similar schedules, in addition to the Tenant well and three Diana wells. Under these pumping conditions, the gradient direction shifted approximately 25 degrees to the north, giving flow directions of N45°W to N65°. The gradient magnitude during this period also increased to about 0.0025. These results show that



northerly-directed flow is dominant whenever Nordstrom well is pumping, or possibly also when the two Dunne wells are pumped together, without Nordstrom pumping.

4. In addition to the larger-scale changes in flow pattern shown in Figure C9, the figure also shows that one-day pump on cycles in a single well can change the direction of the groundwater flow by more than 20 degrees (toward the north). City well pumping data provided in Q4 Report Table C-2 (not included herein) shows that Nordstrom and Tenant wells are typically pumped continuously when they are operation, whereas other City wells, notably Diana #1, #2 and #3, Dunne #1 and Dunne #2 are typically operated on a schedule of about 8 to 20 hours pumping, followed by about 4 to 8 hours off. Each such on-off cycle is clearly represented in Figure 1 (from Q4 Report Figure C9). When Dunne 1 or Dunne 2 is pumping, the flow direction shifts to the north by about 20 degrees, and there is a corresponding increase in gradient magnitude by about 0.002. During the off cycle, the flow direction and gradient both recover to their non-pumping condition. The size of these swings in gradient direction and magnitude tend to be more extreme when pump-on cycles are extended. For example, from November 6 to December 1, 2006, when pumping was alternating between the Dunne 1 and Dunne 2 wells, the flow direction shifted to the north by about 30 degrees during pumping cycles, then back to the west by a similar amount during off cycles. From November 3 to 6 and again from November 11 to 13, Dunne #2 was pumped continuously for extended periods of 66 and 44 hours, respectively, producing a very clear northward shifts in flow direction and increase in gradient, noted in Figure 1.
5. The hydrographs shown in Q4 Report Figure C8 are also illustrative of northeast flow response to City pumping. Of particular note, Figure C8 shows recovery of water levels due to shut-down of the Nordstrom well on November 6, 2006. Water levels in northeast Middle Deep Aquifer zone piezometers recovered by 10 feet (PZ-02-315), 13 feet (PZ-01-333) and 18 feet (PZ-03-325) in response to Nordstrom shut-down. Drawdowns of this magnitude can cause a substantial alteration of groundwater flow patterns in the Deep Aquifer zone, and demonstrate the high degree of hydraulic communication between the Nordstrom Well and these monitoring wells, which are within 1000 feet of the Olin Site. As shown in Figure C8, water levels in the monitoring wells declined by up to five feet during the period from December 7 to 31 when both Dunne #1 and #2 were both pumping in addition to three Diana wells and Tenant, and daily responses to pumping on-off cycles were more pronounced. This suggests that pumping the Dunne wells has appreciable influence on water levels northeast of the Olin Site.
6. Olin does not provide detailed groundwater level data or hydrographs for Deep Aquifer zone piezometers installed at MP-04– 251, 273, 291, and PZ-04-335, 375 in the Q4 Report. Consequently, it is not possible to evaluate the drawdown or recovery response at this location due to changes in the City's northeast pumping. This type of data provided by Olin in the Third Quarter of 2006 showed drawdown of up to 16 feet at MP-04 in response to City pumping. Sporadic groundwater level data included in Q4 Report Table 3.1 (not included herein) shows Middle Deep Aquifer groundwater levels rose substantially between November 1, 2006 (Nordstrom well pumping) and December 7, 2006 (Nordstrom off, and five of six remaining wells pumping). Over this period, groundwater levels at PZ-04-335 and PZ-04-375 rose by 21.95 feet and 22.54 feet, respectively. More detailed hydrographs would have to be provided



by Olin to identify water level recovery attributable only to the shut-down of Nordstrom well on November 6, 2006.

7. The distribution of perchlorate in the Deep Aquifer Zone in Q4 2006 was compiled by WorleyParsons Komex onto a single map, and contoured using Olin's isoconcentration contour levels of 6, 11 and 24.5 ug/L, plus additional contours for 3 and 4 ug/L. The maximum Deep Aquifer Zone perchlorate concentration at each monitoring location in Q4 2006 was used for contouring. The resulting map is provided in Figure 3. This map shows a continuous plume of elevated perchlorate from the Olin Site to the City's northeast wells, consistent with the Olin Site as the source of contamination. Perchlorate concentrations in the northeast triad of monitoring well/piezometer locations (MP-01/PZ-01, MP-02/PZ-02, MP-03/PZ-03) all show Deep Aquifer zone perchlorate concentrations above 4 ug/L, and the lateral extent of these concentrations is not delineated. Perchlorate data from the City's northeast wells must be viewed a minimum values since these wells all have long screens and are completed over multiple intervals, and a thus these wells are not suitable for delineating perchlorate in the Deep Aquifer zones exclusively. Additional delineation in the Deep Aquifer zone by Olin is required.
8. Olin contends in the Q4 Report that perchlorate to the northeast of their Site represents some natural or anthropogenic background condition. However, Olin provides no comprehensive assessment of background concentrations, and more important, no explanation as to why the distribution of perchlorate in the Deep Aquifer Zone northeast of the Site has the characteristics of a plume emanating from the Olin Site, rather than a random distribution of concentrations as might be expected from strictly background concentrations.

## **FIRST QUARTER 2007 GROUNDWATER MONITORING REPORT**

The Q1 Report, like the Q4 Report, also does not include a detailed discussion of northeast flow conditions or perchlorate distribution. Northeast flow data are provided in Appendix C, with the exception of Figures 3.20 and 3.21 in the body of the report. Major comments on the Q1 Report are as follows:

- a) Like the Q4 Report, the Q1 Report does not provide an integrated interpretation of perchlorate data in groundwater in the area beneath the Site and to the northeast of the Site. This deficiency remains in spite of the fact that new highs in perchlorate concentrations were observed in eight of twelve monitoring wells completed in the Middle Deep Aquifer zone during the first quarter 2007.
- b) For the seventh consecutive quarter (third quarter 2005 to first quarter 2007) there is a northerly component of groundwater flow in the area northeast of the Olin Site, as reflected in the hydraulic gradient measured between the triad of piezometers PZ-02-315, PZ-01-333 and PZ-03-325. There were relatively few changes in pumping patterns in the City of Morgan Hill's northeast wells during the first quarter of 2007; therefore, the hydraulic gradient and flow direction showed little variation over the quarter. There is no map of Lower Deep Aquifer zone groundwater elevations in the Q4 Report, although previous groundwater monitoring reports



included a map of groundwater elevation in the Lower Deep Aquifer zone, which typically highlighted the northerly component of flow in this unit.

- c) In the Q1 Report, Olin continues to combine perchlorate data from contaminated wells downgradient of the Site, to the northeast, with more remote wells, in their characterization of "background" concentrations, thereby yielding a biased data set that is in no way representative of anything approaching true background conditions.

## First Quarter 2007 Report Detailed Comments

1. As shown in Q1 Report Figure 3.21, groundwater flow directions between the triad of piezometers PZ-02-315, PZ-01-333 and PZ-03-325 in the first quarter ranged from northwestward (N55°W to N62°W) when City wells were pumping, to westward (N85°W to N90°W) when the wells were off, in the typical daily pumping cycle described previously. As in the previous six quarters (third quarter 2005 to fourth quarter 2006), there is no indication of a southerly component to groundwater flow in the Middle Deep Aquifer zone represented by this triad of piezometers.
2. As noted above, there is no map of Lower Deep Aquifer zone groundwater elevations in the Q1 Report, despite the fact that data are now available for a new monitoring well, PZ-05-390. Previous groundwater monitoring reports (except the Q4 Report) included a map of groundwater elevation in the Lower Deep Aquifer zone, which typically highlighted the northerly component of flow in this unit. The RWQCB should require Olin to include such maps to provide a complete characterization of groundwater flow in the Deep Aquifer zone.
3. New historical high perchlorate concentrations were observed in first quarter 2007 in five Upper Deep Aquifer monitoring wells (MP-16-229, MP-21-278, MP-52-273, MW-04B, MW-53-264); eight Middle Deep Aquifer zone monitoring wells (MW-16-363, MW-52-347, MW-21-295, MW-04C, MW-05C, plus northeast piezometers PZ-01-333 (4.6 ug/L), PZ-02-315 (4.7 ug/L) and PZ-04-335 (8.5 ug/L); and two Lower Deep Aquifer zone monitoring wells (MW-52-403, MW-54-400).
4. The newly-installed PZ-05-390, located approximately 1000 feet northeast of location PZ-04 (1500 feet east of the Site), recorded a perchlorate concentration in the Lower Deep Aquifer zone of 22 ug/L in First Quarter 2007. This piezometer was intended to provide lateral delineation of the perchlorate plume from the Site in the Deep Aquifer zone to the east; however, clearly lateral delineation in the Lower Deep Aquifer zone is incomplete. Moreover, perchlorate concentrations in the northeast monitoring well/piezometer locations (MP-01/PZ-01, MP-02/PZ-02, MP-03/PZ-03, MP-04/PZ-04) in the first quarter 2007 again all show Deep Aquifer zone perchlorate concentrations above 4 ug/L. Confirmed perchlorate concentrations greater than 4 ug/L have now been noted over consecutive quarters in several of these wells, including:
  - At MP-01/PZ-01: PZ-01-333 (2 quarters);
  - At MP-02/PZ-02: MP-02-255 (3 quarters); PZ-02-315 (4 quarters); PZ-02-415 (4 quarters);



- At MP-03/PZ-03: PZ-03-427 (4 quarters);
- At MP-04/PZ-04: MP-04-273 (4 quarters);

The most recent sampling data in the Deep Aquifer zone confirms the presence of a significant perchlorate plume to the northeast and east of the Olin Site. The lateral extent of this perchlorate plume beyond these wells is not delineated. Clearly, additional delineation by Olin of the perchlorate plume in the Deep Aquifer zone northeast and east of the Site is required.

5. In spite of this important new information on perchlorate distribution east and northeast of the Site, Olin's mapping of the perchlorate distribution in the Deep Aquifer zone continues to show the northeast perchlorate detections as isolated occurrences, for example, as illustrated in Q1 Report Figure 3.31. No rational explanation is provided by Olin for such contouring of the data.
6. The distribution of perchlorate in the Deep Aquifer Zone in Q1 2007 was compiled by WorleyParsons Komex onto a single map, contoured using Olin's isoconcentration contour levels of 6, 11 and 24.5 ug/L, plus additional contours for 3 and 4 ug/L. The maximum Deep Aquifer Zone perchlorate concentration at each monitoring location in Q1 2007 was used for contouring, as shown in Figure 4. Figure 4 shows a continuous plume of perchlorate in the Deep Aquifer to the northeast of the Olin Site, although the plume has contracted somewhat between fourth quarter 2006 and first quarter 2007, likely in response to the change in hydraulic gradient and groundwater flow direction that corresponded to the reduced pumping from the City's northeast wells during this period.
7. The trend analysis for perchlorate in the Deep Aquifer does not appear to have been thoroughly analyzed by Olin, at least in terms of their mapping of perchlorate trends in the Deep Aquifer shown in Figure 3.30. Furthermore, there is no tabulation of Mann Kendall results for monitoring wells in either the Tables or Appendices of the Q1 Report. The following 21 wells meet Olin's criteria for Mann Kendall analysis (greater than four samples, with at least half the results above the reporting limit of 4 ug/L) and yet do not appear to have been plotted by Olin on Figure 3.30 or otherwise discussed by Olin in the Q1 Report [note: in brackets, number of detections > 4 ug/L / number of samples]:

#### Deep Aquifer - Upper

- MP-02-255 (3/6)
- MP-17-217 (8/8)
- MP-21-278 (6/7)
- MP-52-273 (5/5)
- MW-04B (6/8)
- MW-05B (4/8)
- MW-53-195 (5/5)
- MW-53-264 (5/5)



## Deep Aquifer - Middle

- MP-21-295 (6/7)
- MP-52-295 (5/5)
- MW-04C (8/8)
- MW-05C (8/8)
- MW-16-328 (7/7)
- MW-16-363 (6/6)
- MW-21-332 (6/6)
- MW-52-347 (6/6)
- PZ-02-315 (4/6)

## Deep Aquifer -Lower

- MW-52-403 (6/6)
- MW-54-400 (4/4)
- PZ-02-415 (4/7)
- PZ-03-427 (6/7)

Note that this list includes ten wells in the Deep Aquifer zone that recorded new historical high perchlorate concentrations in the first quarter 2007, yet this appears to have gone un-noticed by Olin. While Olin may be correct that the southern plume in the Shallow and Intermediate aquifers are generally stable, the perchlorate plume in the Deep Aquifer Zone is clearly getting worse, particularly in the area northeast of the Site.

8. As an indication that Olin has failed to detect this trend of increasing perchlorate concentrations in the Deep Aquifer zone, the Q1 Report concludes that "The elevated perchlorate concentrations observed at MW-06C are anomalous." (Q1 Report, p. 3-8). There is no basis for this statement. While the concentrations in this well in the Middle Deep Aquifer have been quite variable, duplicate sampling on two occasions (Q3 2006 and Q1 2007) confirmed the high concentrations (19 to 21 ug/l and 9.2 to 9.3 ug/L, respectively) detected in this well. The pattern of higher and lower concentrations in this well track very closely with those in well MW-06B, completed in the Upper Deep Aquifer at the same site, but with lower overall concentrations. It should also be noted that nearby on-Site Middle Deep Aquifer monitoring wells MW-04C and MW-05C recorded new historical high concentrations in the first quarter 2007, of 30 and 26 ug/L, respectively. Elevated perchlorate concentrations in the Deep Aquifer Zone on-Site are far from anomalous. They are characteristic of the groundwater in the Deep Aquifer beneath the Olin Site.
9. Olin's characterization of "background" perchlorate concentrations in the Q1 Report continues to utilize wells in the northeast plume that are clearly contaminated with perchlorate from the



Olin site, as illustrated in Figure 4. For example, Olin's assessment of background perchlorate represented by Figure 3.32 of the Q1 Report includes the Tenant well at 7.40 ug/L, which is indisputably contaminated with perchlorate from the Olin Site. Any characterization of background conditions clearly must exclude any and all wells that could potentially be impacted by perchlorate from the Olin Site.

## CLOSING

With the data from the two above reports, a clear picture of perchlorate contamination in the Deep Aquifer Zone is emerging. The main features of this picture are:

- Direct hydraulic communication through the Deep Aquifer from the Olin Site to the City's northeast wells, as indicated by the immediate hydraulic response to City pumping;
- Consistent, long-term northerly directed flow from the Olin Site toward the City's northeast wells;
- A confirmed perchlorate plume in the Deep Aquifer northeast and east of the Olin Site, with perchlorate detections consistently in excess of 4 ug/L;
- Widespread increases in perchlorate concentrations in the Deep Aquifer zone, and a lack of lateral delineation of the plume to the east and northeast of the Site, particularly in the area between Olin's northeast monitoring well locations and the City's production wells.

WorleyParsons Komex is pleased to provide these comments to the RWQCB and we are at your disposal to discuss any of the issues noted above. If you have any questions or need additional information please contact Mark Trudell at (310) 547-6357, or by e-mail at [mark.trudell@worleyparsons.com](mailto:mark.trudell@worleyparsons.com).

Sincerely,  
WorleyParsons Komex

Mark Trudell, Ph.D., PG, CHG  
Principal Hydrogeologist

Ralph Beck, PG  
Project Director

Encl.  
cc: Mr. Steve Hoch, Hatch & Parent  
Mr. Jim Ashcraft, City of Morgan Hill



**WorleyParsons Komex**

resources & energy

## FIGURES





**WorleyParsons Komex**

resources & energy

**ATTACHMENT A**  
**CITED OLIN REPORT FIGURES**

## **FOURTH QUARTER 2006 REPORT FIGURES**

## **FIRST QUARTER 2007 REPORT FIGURES**

## **PETITION EXHIBIT 18**



# WorleyParsons Komex

resources & energy

## Environment & Water Resources

5455 Garden Grove Blvd., 2<sup>nd</sup> Floor  
Westminster, CA 92683 USA  
Telephone: +1 714 379 1157  
Facsimile: +1 714 379 1160  
worleyparsons.com

6 September, 2007

Proj. No.: H0562C  
File Loc.: Westminster

California Regional Water Quality Control Board  
Central Coast Region  
895 Aero Vista Drive, Suite 101  
San Luis Obispo, CA 93401  
Attention: Hector Hernandez

Dear Mr. Hernandez:

**RE: REVIEW OF OLIN CORPORATION REPORTS: (1) LLAGAS SUBBASIN  
CLEANUP WORKPLAN, JUNE 15, 2007; (2) SECOND QUARTER 2007  
GROUNDWATER MONITORING REPORT, JULY 30, 2007**

On behalf of the City of Morgan Hill (the City), WorleyParsons Komex has reviewed the Olin Corporation (Olin) June 15, 2007 report, "Llagas Subbasin Cleanup Work Plan" (the Workplan) and the July 30, 2007 report "Second Quarter 2007, Groundwater Monitoring Report" (the Q2 Report) for the Olin property at 425 Tennant Avenue, Morgan Hill, California (the Site), submitted to the Central Coast Regional Water Quality Control Board (RWQCB). For reader convenience, figures from these reports cited in this letter are included in Attachment A.

### **LLAGAS SUBBASIN CLEANUP WORKPLAN**

The Workplan is based on an earlier feasibility study report, the December 6, 2006 report, "Llagas Subbasin Cleanup Feasibility Study - Revised" (The FS). Both reports result from a sequence of regulatory directives, particularly the March 10, 2005 RWQCB Cleanup and Abatement Order R3-2005-0014 [2005 CAO]. Comments on the FS by WorleyParsons Komex have been previously provided to RWQCB on January 19, 2007, the text of which is included with this letter as Attachment B.

The Workplan carries forward the overall strategy described by the FS; therefore, many concerns identified with the FS, described in detail in the WorleyParsons Komex January 19, 2007 comment letter, recur in the Workplan. These concerns are summarized as follows:

- a) Background perchlorate levels in the Llagas Subbasin still have not been determined by Olin, by either the process for determination of background concentration of contaminants under California Code of Regulations [CCR] Title 23, Division 3, Chapter 15 Sections 2550.4 and 2550.7, or CCR Title 27, Division 2, Subdivision 1, Chapter 3, Subchapter 3, Article 1 Section 20400 as required by the RWQCB in their letter of October 6, 2006 commenting on the original June 30, 2006 FS report. The RWQCB has been very explicit



in asking that this be accomplished; however, it is unclear why Olin has not complied with the RWQCB directive.

- b) State Water Resources Control Board (SWRCB) Resolution Number 92-49 requires that background concentrations be determined in accordance with the above methods if a cleanup level greater than background is proposed. Until a background level is developed in accordance with the above-referenced regulations the RWQCB must continue to hold Olin to a cleanup level of background, that is, 1.4 micrograms per liter (ug/L) as defined by the RWQCB in their October 6, 2006 letter to Olin. The technical and economic feasibility of cleanup to background was addressed in the WorleyParsons Komex comment letter of January 19, 2007 (Attachment B).
- c) Resolution Number 92-49 specifies the conditions under which a cleanup level other than background can be proposed, as summarized in the RWQCB October 6, 2006 comment letter. A key condition is that the proposed cleanup level be the lowest concentration technically and economically achievable. The Workplan contains no technical or economic justification for the proposed 6 ug/L cleanup level, since the FS showed that cleanup to less than 2 ug/L was both technically and economically feasible.

Detailed comments specifically related to the Workplan are provided below.

- a) The Workplan fails to acknowledge or address the ongoing occurrence of perchlorate in the Deep Aquifer in the area northeast of the Olin Site, which is impacting operating water supply wells of the City of Morgan Hill. Groundwater impacts in this area due to the Olin Site are well documented for several consecutive quarters. None of the Priority Zone B or C monitored attenuation (MA) performance monitoring wells listed in Table 4.1 of the Workplan in either the Intermediate or Deep Aquifer zones are located within 2,500 feet south of the Site, let alone north or east of the Olin Site. Moreover, as shown in Cleanup Workplan Figure 4.4, the nearest Deep Aquifer zone MA performance monitoring well is 6,700 feet south of the Olin Site, at MP-21/MW-21. The Workplan by Olin for Priority Zones B and C must address cleanup of impacted groundwater east, north, and northeast of the Olin Site, which it fails to do; and, at the very least, provide a detailed MA performance monitoring program for these areas, as well as other areas, in closer proximity to the Olin site than 2,500 feet away, and definitely closer than 6,700 feet in the Deep Aquifer zone.
- b) Olin states that "...declining concentrations due to overall attenuation should follow an exponential decay curve over long periods of monitoring..." (Workplan p 2-11). However, Olin presents no data from the Llagas Subbasin to validate the proposed first-order decay model or to support either the length of time expected to either reach the cleanup goal or asymptotic leveling off at some concentration other than the cleanup goal. Such assertions require some demonstration of validity. In fact, the existing data seem to indicate otherwise. High levels of perchlorate in Zone I groundwater persist downgradient of the active on-Site source zone soil and groundwater remediation that has been ongoing for over three years (since February 2004), contradicting Olin's contention of rapid perchlorate attenuation downgradient of active remediation. Evaluation of concentration trends in monitoring wells, discussed in the FS (Appendix C) indicated that more than two-



thirds of wells do not show a decreasing trend in perchlorate concentrations. Consequently, it appears that dilution and dispersion are, in fact, not actively reducing perchlorate concentrations and that natural attenuation of the perchlorate plume in the B and C zones is likely to be a very long-term proposition. Consequently, the technically and economically feasible option of active groundwater extraction and treatment should be implemented for B and C zone remediation.

- c) Olin suggests that biological degradation of perchlorate will be a significant attenuation mechanism in the Deep Aquifer. Olin notes that such degradation would coincide with denitrification and would be mediated by the same facultative anaerobic bacteria (Workplan p 2-12 and 4-16 to 19). However, Olin has again provided no evidence to support the contention that denitrification or perchlorate reduction is occurring in the Deep Aquifer. And again, as noted above, in fact, Olin's own data show that nitrate concentrations in the Deep Aquifer downgradient of the Site are nearly everywhere in excess of 20 milligrams per litre (mg/L). Similarly, perchlorate concentrations above the public health goal (PHG) are observed extensively in the Deep Aquifer downgradient of the site. Both of these facts clearly suggest that neither denitrification nor perchlorate reduction are occurring to any appreciable extent in the Deep Aquifer zone downgradient of the Site. The mere absence of high nitrate concentrations in the Deep Aquifer at a few isolated locations is certainly no evidence of denitrification, since it cannot be demonstrated that nitrate was ever present in groundwater at these locations.

Olin also proposes to analyze groundwater samples for the presence of bacteria capable of degrading perchlorate. However, the presence of bacteria that can degrade nitrate or perchlorate will not be evidence that either denitrification or perchlorate reduction are occurring since these facultative anaerobic bacteria can also use dissolved oxygen as their terminal electron acceptor and are commonly found under aerobic conditions that do not support denitrification or perchlorate reduction. Under the groundwater conditions present in the Llagas Subbasin, perchlorate must be considered as a persistent contaminant. Consequently, active remediation, including groundwater extraction and treatment, should be conducted by Olin in all priority zone, including the B and C zones.

## **SECOND QUARTER 2007 GROUNDWATER MONITORING REPORT**

The Q2 Report, like other recent Olin groundwater monitoring reports, does not include a detailed discussion of northeast flow conditions or perchlorate distribution. Northeast flow data are provided in Appendix C, with the exception of Figures 3.20 and 3.21 in the body of the report. Major comments on the Q2 Report are as follows:

- a) Like previous groundwater monitoring reports, the Q2 Report does not provide an integrated interpretation of perchlorate data in groundwater in the area beneath the Site and to the northeast of the Site. This deficiency remains in spite of the fact that eight Deep Aquifer monitoring wells north of Tennant Avenue had perchlorate concentrations above 4 ug/L during the second quarter 2007. Also, the consistently northward component of flow in the Middle Deep Aquifer and the continuous presence of elevated perchlorate concentrations from the Olin site to the northernmost extent of instrumentation are irrefutable evidence of a



contiguous plume of perchlorate from the Site to the northeast, including several of the City's wells. Olin's mapping of the perchlorate distribution in the Deep Aquifer zone continues to show northeast perchlorate detections as isolated occurrences, detached from the main perchlorate plume emanating from the Site. Absolutely no rational explanation has been provided by Olin for such contouring of the data. It is noteworthy, however, that in the Q2 Report Figure 3.24 for the first time Olin's mapping of the Deep Aquifer perchlorate plume encompasses location PZ-02, located northeast of the Site.

- b) For the eighth consecutive quarter (third quarter 2005 to second quarter 2007) there is a consistent northerly component of groundwater flow in the area northeast of the Olin Site, as reflected in the hydraulic gradient measured between the triad of piezometers PZ-02-315, PZ-01-333 and PZ-03-325. The start-up of the Nordstrom Well in early May 2007 was accompanied by a 10 degree northerly shift in groundwater flow direction that persisted for the remainder of the data record.

## Second Quarter 2007 Report Detailed Comments

- a) As shown in Q2 Report Figure 3.21, groundwater flow directions between the triad of piezometers PZ-02-315, PZ-01-333 and PZ-03-325 through April 2007, with the Nordstrom well off-line, was northwestward (approximately N55°W) when City wells were pumping, and westward (N70°W to N90°W) when the wells were off, reflecting the typical daily pumping cycle of the City's wells. With the start-up of the Nordstrom Well in early May (approximately May 3) there was an immediate shift in groundwater flow direction of approximately 10 degrees to the north, resulting in a groundwater flow direction of N45°W, which was maintained for the duration of recorded data (to approximately June 19, 2007). As in the previous seven quarters (third quarter 2005 to first quarter 2007), there is no indication of a southerly component to groundwater flow in the Middle Deep Aquifer zone represented by this triad of piezometers.
- b) The recently-installed PZ-05-390, in the Lower Deep Aquifer, located approximately 1,000 feet northeast of location PZ-04 (1,500 feet east of the Site), recorded a perchlorate concentration of 22 ug/L in first quarter 2007 and 14 ug/L in second quarter 2007. This piezometer was intended to provide lateral delineation of the perchlorate plume from the Site in the Deep Aquifer zone to the east; however, clearly lateral delineation in the Lower Deep Aquifer zone is incomplete. Moreover, perchlorate concentrations in three northeast monitoring well/piezometer locations (MP-02/PZ-02, MP-03/PZ-03, MP-04/PZ-04) again in the second quarter 2007 show Deep Aquifer zone perchlorate concentrations above 4 ug/L. Confirmed perchlorate concentrations greater than 4 ug/L have now been noted over consecutive quarters in several of these wells, including:
  - I. At MP-02/PZ-02: PZ-02-315 (5 quarters); PZ-02-415 (5 quarters);
  - II. At MP-03/PZ-03: PZ-03-427 (5 quarters); and
  - III. At MP-04/PZ-04: MP-04-273 (5 quarters).





The most recent sampling data in the Deep Aquifer zone confirms the presence of a significant perchlorate plume to the northeast and east of the Olin Site. The lateral extent of this perchlorate plume beyond these wells is not delineated. Clearly, additional delineation by Olin of the perchlorate plume in the Deep Aquifer zone northeast and east of the Site is required.

- c) The trend analysis for perchlorate in the Deep Aquifer does not appear to have been thoroughly analyzed by Olin, at least in terms of their mapping of perchlorate trends in the Deep Aquifer shown in Figure 3.27. In the Q2 Report, Olin makes reference to the Mann-Kendall analysis of trend only for domestic wells. There is no reference to the Mann-Kendall analysis for their own monitoring wells. This oversight is not acceptable since reliable data for the Deep Aquifer zone are almost entirely from Olin's monitoring wells, not domestic wells. The mapping of perchlorate trend in the Deep Aquifer (Figure 3.27) does appear to show data points corresponding to selected monitoring wells, however if this is the case, the related trend analysis is completely undocumented in the Q2 Report.

The following 21 monitoring wells meet Olin's criteria for Mann-Kendall analysis (greater than four samples with at least half the results above the reporting limit of 4 ug/L) and yet do not appear to have been plotted by Olin on Figure 3.27 or otherwise discussed by Olin in the Q2 Report (note: in parentheses, number of detections > 4 ug/L / number of samples):

#### Deep Aquifer - Upper

- MP-02-255 (3/7)
- MP-17-217 (9/9)
- MP-21-278 (6/8)
- MP-52-273 (6/6)
- MW-04B (7/8)
- MW-05B (4/9)
- MW-53-195 (6/6)
- MW-53-264 (6/6)

#### Deep Aquifer - Middle

- MP-21-295 (6/8)
- MP-52-295 (6/6)
- MW-04C (8/8)
- MW-05C (8/8)
- MW-16-328 (8/8)
- MW-16-363 (7/7)



- MW-21-332 (7/7)
- MW-52-347 (7/7)
- PZ-02-315 (5/6)

Deep Aquifer -Lower

- MW-52-403 (7/7)
- MW-54-400 (5/5)
- PZ-02-415 (5/8)
- PZ-03-427 (6/8)

Moreover, Olin overstates the results of the trend analysis in section 3.2.3, which states, "The number of wells in each quarter with the most recent concentrations between 4.0 and 6.0 ug/L has fluctuated since 2004, but since Second Quarter 2005 has steadily declined..." In fact, the chart embedded in this section of the Q2 Report shows that since the second quarter of 2005, the number of wells in the concentration range increased from the previous quarter four times, and decreased four times. This hardly constitutes a "steady decline". If anything, the data indicate a stable trend since 293 wells were in this range in the second quarter 2007, compared to 248 in third quarter 2005.

- d) Olin proposes to eliminate a large number of monitoring wells from their sampling program, notably wells completed in the Deep Aquifer Zone, as listed in Q2 report Table 3.8. Ironically, the Deep Aquifer zone is the least well understood unit in the Llagas Basin, and is the focus of ongoing characterization activities by Olin that seem to show a greater than expected extent of perchlorate impact with each new installation. In the Lower Deep Aquifer zone, the perchlorate plume is undelineated in all directions, except possibly between sites MW-54 and MW-26, 15,000 feet downgradient of the Site. Yet Olin proposes to eliminate the two Lower Deep Aquifer monitoring wells at MW-26 from the sampling program, even though they are directly downgradient of the perchlorate plume at site MW-54 (12 ug/L) and along the center line of the plume.

The wells proposed for elimination have generally shown low perchlorate detections or have been non-detect for perchlorate. However, these wells should be retained for the following reasons:

- I. These low concentration and non-detect wells provide important vertical and/or lateral delineation of the perchlorate plume in the Deep Aquifer zone (as illustrated above);
- II. Groundwater extraction for the interim remediation program planned by Olin may cause groundwater flow patterns to shift and result in a vertical and/or lateral shift in impacted zones in the Deep Aquifer. These wells could provide valuable information on these potential changes in plume distribution;



- III. Ongoing sampling could provide information on the breakthrough of perchlorate contamination in areas not previously impacted at a significant level; and
- IV. Two of the wells Olin proposes to remove from the sampling program are vertical control wells that are indicated in Table 4.1 of the Workplan as required for performance monitoring (MP-44-278 and MW-54-500).

In addition, in the absence of a well-documented trend analysis of perchlorate in monitoring wells, there is no way of knowing which of these wells might be located downgradient of a well with increasing perchlorate trend, and therefore well-suited to monitoring of the breakthrough arrival of perchlorate. Therefore, all of the proposed Deep Aquifer zone monitoring wells should be retained for regular quarterly sampling.

## CLOSING

WorleyParsons Komex hopes this review is helpful to the RWQCB in your ongoing efforts to cleanup perchlorate released from the Olin Site. We are at your disposal to discuss any of the comments above. If you have any questions or need additional information please call Mark Trudell at 310 547-6357, or by e-mail at [mark.trudell@worleyparsons.com](mailto:mark.trudell@worleyparsons.com).

Sincerely,  
WorleyParsons Komex

Mark Trudell, Ph.D., PG, CHG.

Principal Hydrogeologist

Ralph Beck, PG

Project Director

enc.

cc: Mr. Jim Ashcraft, City of Morgan Hill  
Mr. Steven Hoch, Hatch and Parent



## **REFERENCES**

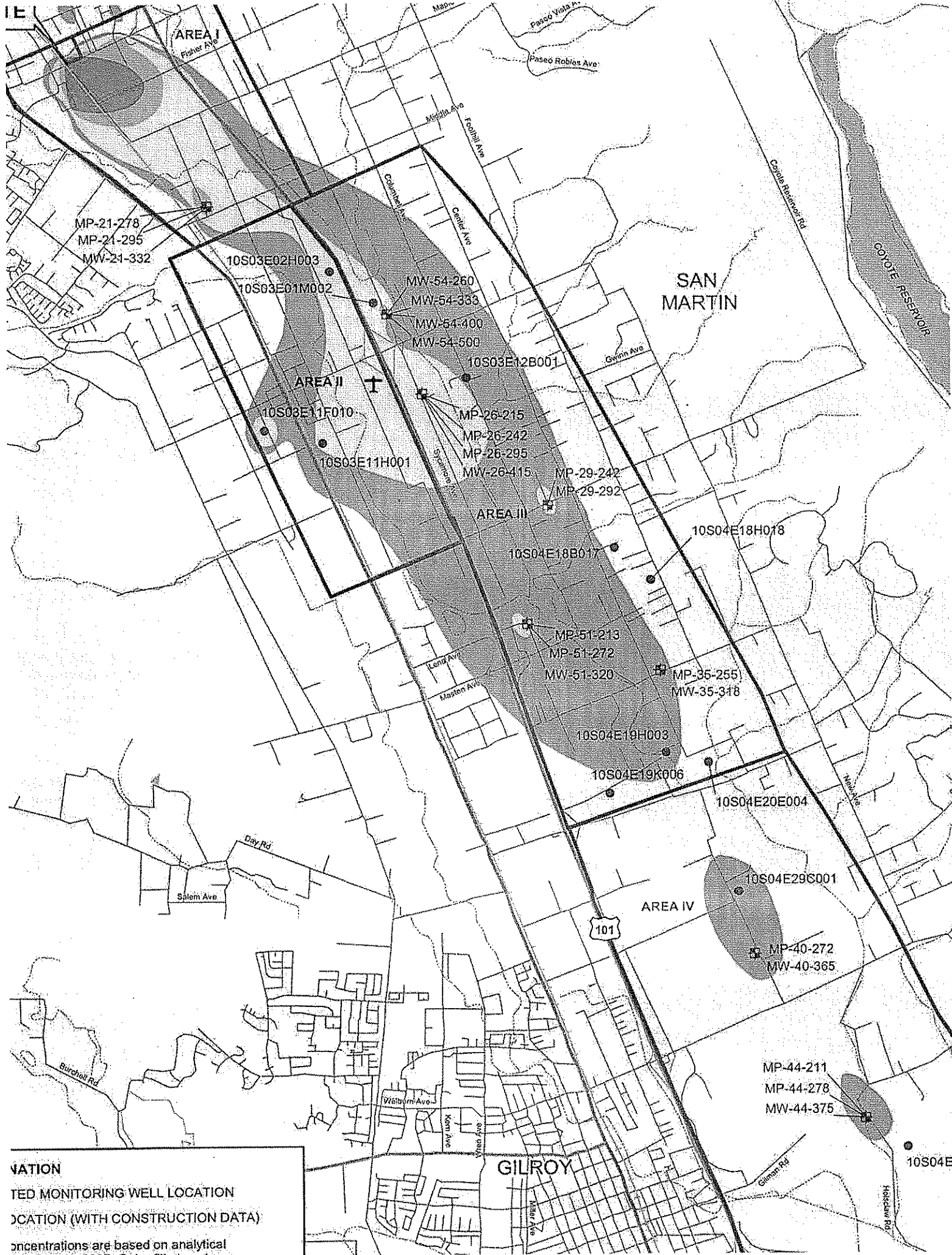
MACTEC Engineering and Consulting, Inc. (MACTEC), 2006a. Llagas Subbasin Cleanup Feasibility Study - Revised for the Olin property at 425 Tennant Avenue, Morgan Hill, California. December 6, 2006

Regional Water Quality Control Board Central Coast Region (RWQCB), 2006 Letter from Roger W. Briggs, Executive Officer, Water Board, Central Coast Region to Richard W. McClure, Olin Corporation: SLIC: 425 Tennant Ave. Morgan Hill; Llagas Subbasin Cleanup Feasibility Study. October 6, 2006.

WorleyParsons Komex 2007. Review of Olin Corporation December 6, 2006 Llagas Subbasin Cleanup Feasibility Report - Revised. Letter to Hector Hernandez, RWQCB. January 19, 2007.

**ATTACHMENT A**  
**CITED OLIN REPORT FIGURES**

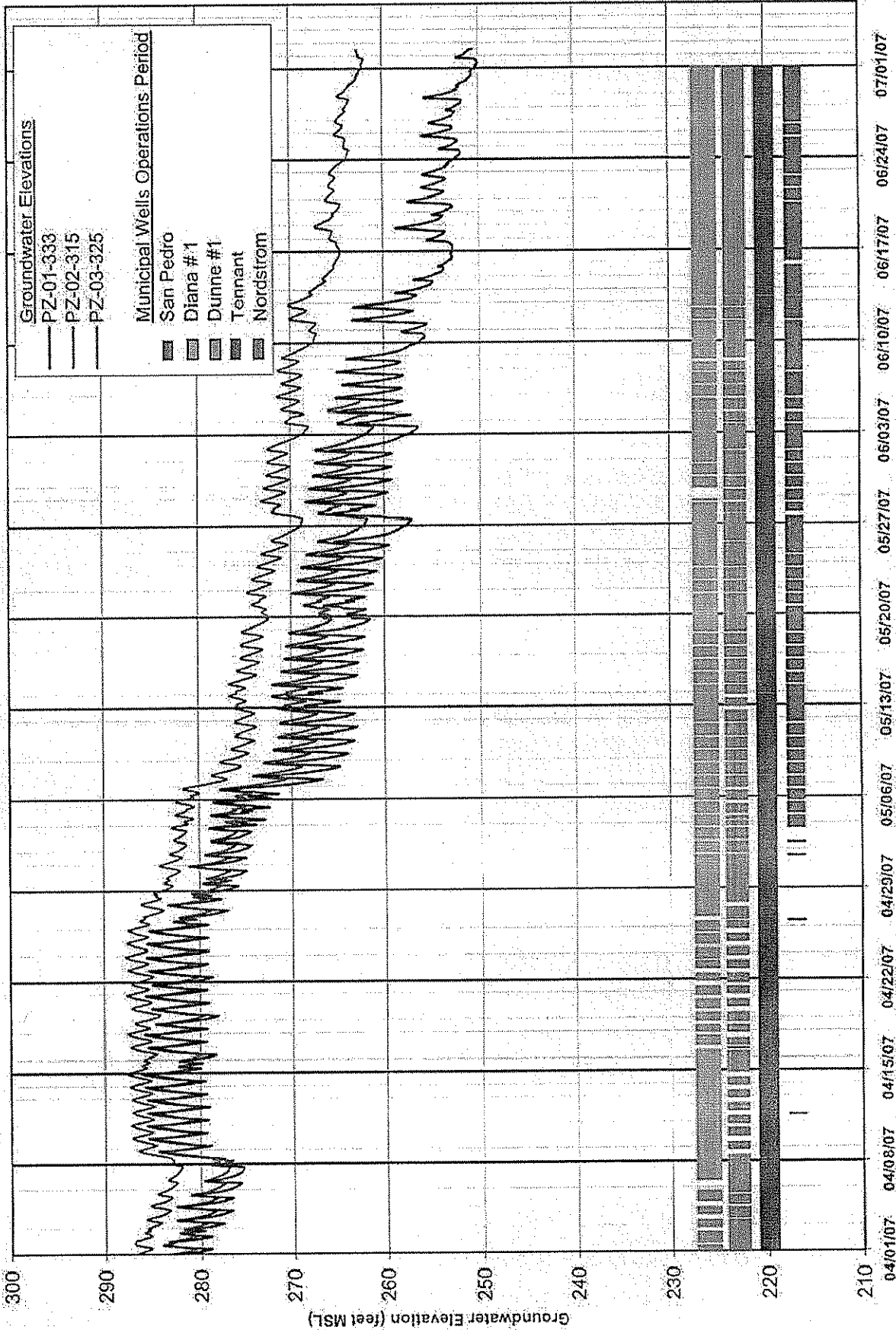
## **CLEANUP WORKPLAN FIGURES**



ATION  
TED MONITORING WELL LOCATION  
LOCATION (WITH CONSTRUCTION DATA)  
oncentrations are based on analytical

## **SECOND QUARTER 2007 REPORT FIGURES**





FIGURE

3.20

**Piezometer Hydrographs and Municipal Well Operations**

Second Quarter 2007 Groundwater Monitoring Report

Olin/Standard Fusee Site

Morgan Hill, California

CHECKED

CHECKED DATE 7/07

APPROVED

APPROVED DATE

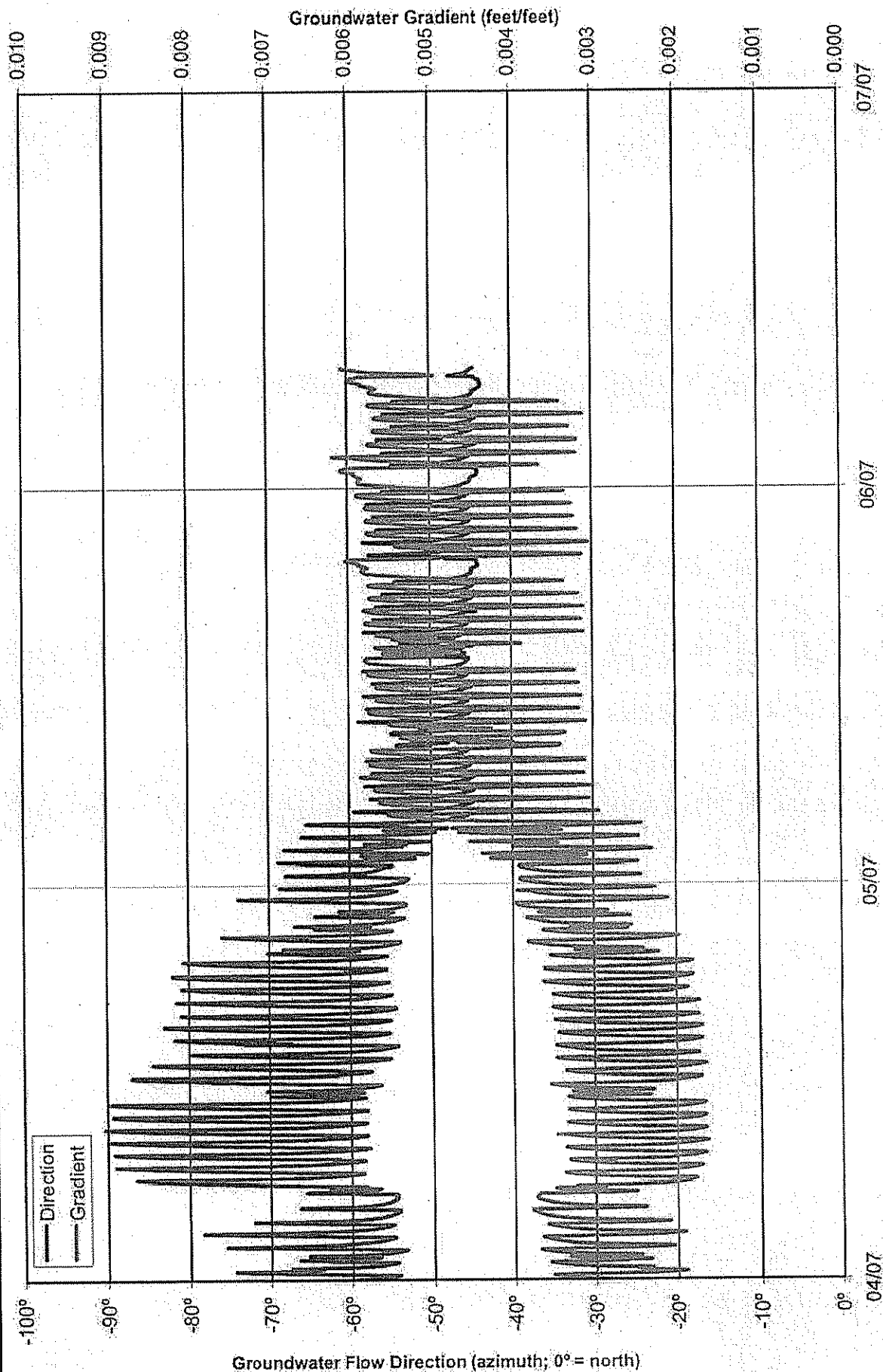
7/07




**MACTEC**

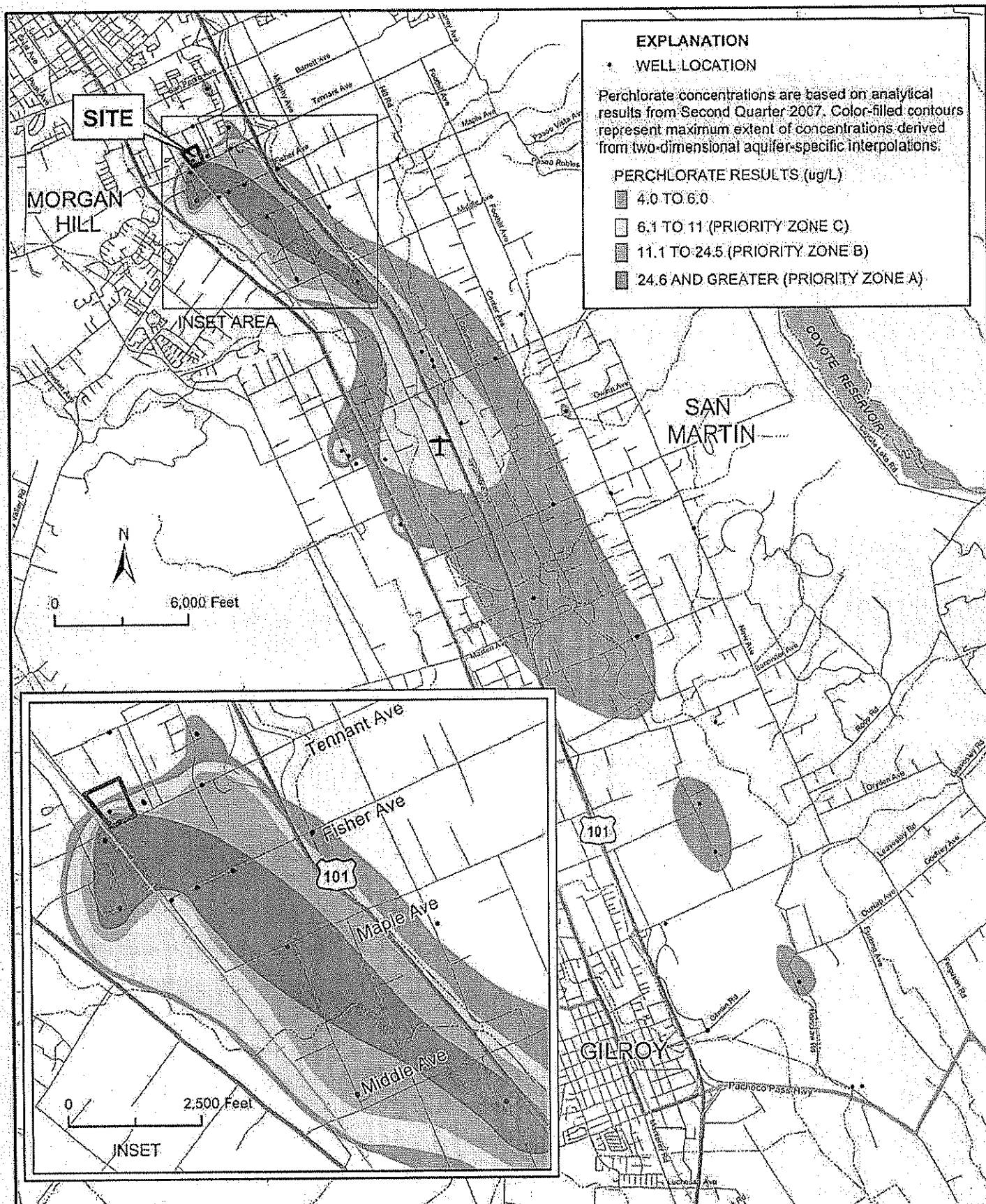
DRAWN BY  
LNC

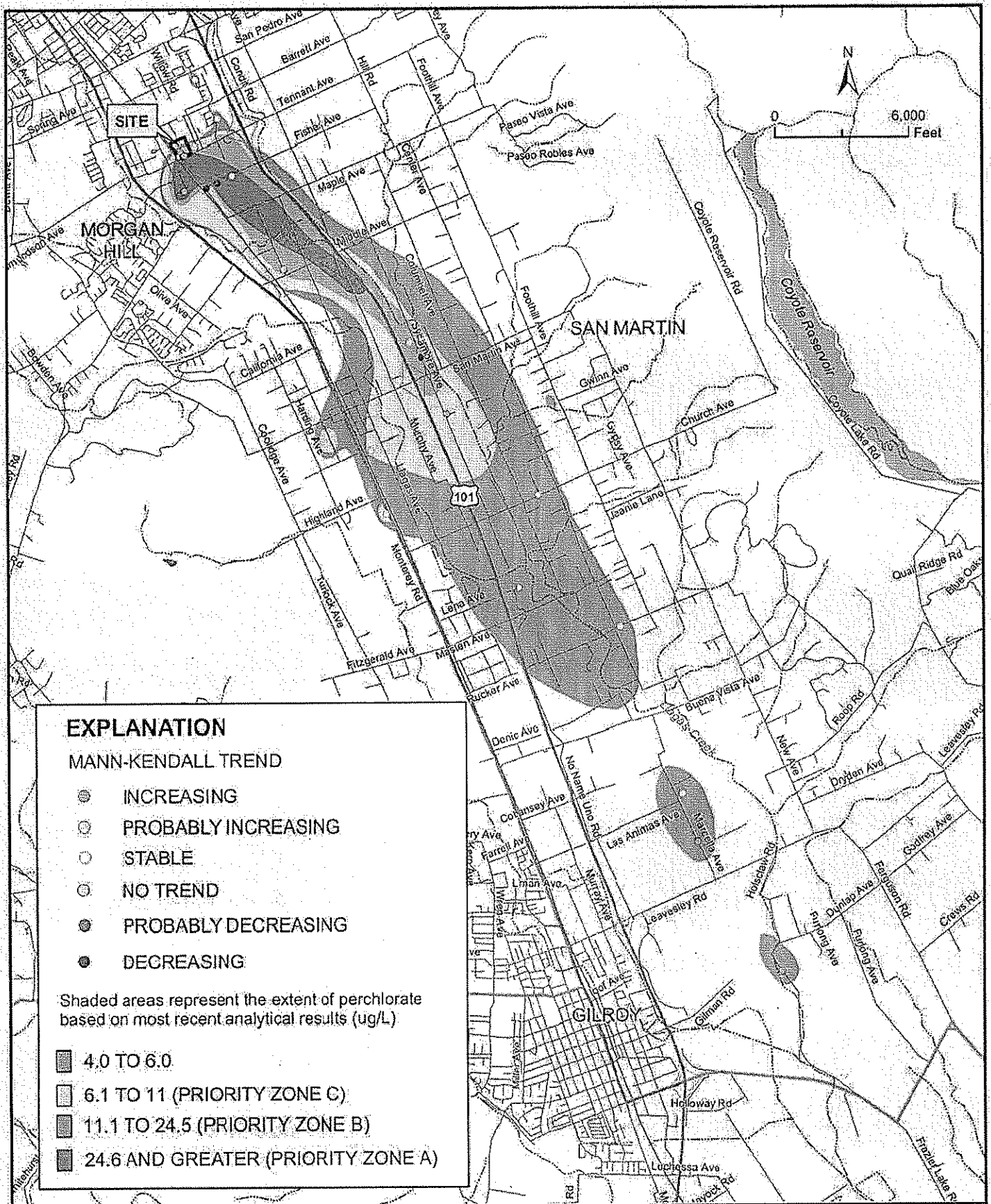
JOB NUMBER

6100070002 09.06



	<b>Groundwater Flow Direction and Gradients</b> Middle Deep Aquifer (Second Quarter 2007) Second Quarter 2007 Groundwater Monitoring Report Olin/Standard Fusee Site Morgan Hill, California		FIGURE <h1>3.21</h1>
	DRAWN BY LNC	JOB NUMBER 6100070002 09.06	CHECKED 
APPROVED 		APPROVED DATE 7/07	





**Spatial Distribution of Concentration Trends**  
 Deep Aquifer  
 Second Quarter 2007 Groundwater Monitoring Report  
 Olin/Standard Fusee Site  
 Morgan Hill, California

FIGURE  
**3.27**

DRAWN  
 GFA

JOB NUMBER  
 6100070002 09.06

CHECKED

CHECKED DATE  
 7/2007

APPROVED

APPROVED DATE  
 7/07

**ATTACHMENT B**  
**WORLEYPARSONS KOMEX JANUARY 19, 2007 COMMENT LETTER**  
**ON LLAGAS SUBBASIN CLEANUP FEASIBILITY STUDY - REVISED**  
**(Text Only)**



# WorleyParsons Komex

resources & energy

## Environment & Water Resources

5455 Garden Grove Blvd., 2<sup>nd</sup> Floor  
Westminster, CA 92683 USA  
Telephone: +1 714 379 1157  
Facsimile: +1 714 379 1160  
worleyparsons.com

19 January 2007

Proj. No.: H0562C  
File Loc.: Westminster

California Regional Water Quality Control Board  
Central Coast Region  
895 Aero Vista Drive, Suite 101  
San Luis Obispo, CA 93401

Dear Mr. Hernandez:

### **RE: REVIEW OF OLIN CORPORATION DECEMBER 6, 2006 LLAGAS SUBBASIN CLEANUP FEASIBILITY STUDY - REVISED**

On behalf of the City of Morgan Hill (the City), WorleyParsons Komex has reviewed the Olin Corporation (Olin) December 6, 2006 Report, "Llagas Subbasin Cleanup Feasibility Study - Revised" (the FS Report) for the Olin property at 425 Tennant Avenue, Morgan Hill, California (the Site), submitted to the Central Coast Regional Water Quality Control Board (RWQCB).

The FS Report is a revision of an earlier feasibility study report, the June 30, 2006 "Llagas Subbasin Cleanup Feasibility Study Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California" (MACTEC 2006a; June 30<sup>th</sup> FS Report). Both reports result from a sequence of regulatory directives, particularly the March 10, 2005 RWQCB Cleanup and Abatement Order R3-2005-0014 [2005 CAO] Ordering Paragraph J. RWQCB comments on the June 30<sup>th</sup> FS Report were documented in October 6, 2006 correspondence to Olin (RWQCB 2006a). Previously, RWQCB also provided comments to Olin on their January 31, 2006 Cleanup Level Report (MACTEC 2006b) in a letter dated March 2, 2006 (RWQCB 2006b). Consequently, the current FS report is expected to address the comments and requirements provided in the March 2, 2006 and October 6, 2006 letters from RWQCB to Olin.

## **1. OUTSTANDING DEFICIENCIES**

WorleyParsons Komex on behalf of the City of Morgan Hill provided detailed comments on the June 30<sup>th</sup> FS report in a letter to RWQCB dated July 24, 2006 (WorleyParsons Komex 2006a). While the revised FS report addresses some of the deficiencies noted by the City in the July 24, 2006 comment letter, there are many deficiencies that this current FS does not address. However, we will not reiterate our comments at this time, other than to summarize outstanding concerns:

- a) Background perchlorate levels in the Llagas Subbasin still have not been determined by Olin, by either the process for determination of background concentration of contaminants under California Code of Regulations [CCR] Title 23, Division 3, Chapter 15 Sections



2550.4 and 2550.7, or CCR Title 27, Division 2, Subdivision 1, Chapter 3, Subchapter 3, Article 1 Section 20400 as required by the RWQCB in their October 6, 2006 comment letter. The RWQCB has been very explicit in asking that this be accomplished.

- b) State Water Resources Control Board (SWRCB) Resolution Number 92-49 requires that background concentrations be determined in accordance with the above methods if a cleanup level greater than background is proposed. Until a background level is developed in accordance with the above-referenced regulations the RWQCB must continue to hold Olin to a cleanup level of background, that is, 1.4 micrograms per liter (ug/L) as defined by the RWQCB in their October 6, 2006 letter to Olin.
- c) Resolution Number 92-49 specifies the conditions under which a cleanup level other than background can be proposed, as summarized in the RWQCB October 6, 2006 comment letter, and also summarized in the FS Report Section 4 (p. 4-1 and 4-2). A key condition is that the proposed cleanup level be the lowest concentration technically and economically achievable. The FS Report once again does not provide any technical or economic justification for the proposed 6 ug/L cleanup level, since the FS Report shows that cleanup to less than 2 ug/L (Olin's proxy for background) is both technically and economically feasible.

In addition to these outstanding concerns, we note that many of the comments raised in the RWQCB October 6, 2006 letter have also not been addressed in the current FS Report as would have been expected; however, we will defer to the RWQCB for their comments on such deficiencies. The general and specific technical comments from our review of the current FS Report are discussed below.

## **2. DEFICIENCIES OF REVISED FS REPORT**

Overall, the revised FS Report does not meet the requirements of the March 10, 2005 CAO Ordering Paragraph J, or clarifying conditions raised in the October 6, 2006 RWQCB Comment letter. Beyond the above-noted issues of undetermined background perchlorate and inappropriate cleanup level, the overriding deficiency of the FS Report is the incomplete and inconsistent evaluation of the technical feasibility of the groundwater extraction/ex-situ treatment option for Priority Zones B and C, and the sub-Public Health Goal (PHG) zone (< 6 ug/L). We note that a separate feasibility study (FS) prepared by GeoSyntec (Zone A FS Report; GeoSyntec, 2006) was submitted on December 6, 2006 by Olin for Priority Zone A; therefore, our comments below on Zone A cleanup are at present limited, and will be presented in more detail in our review of the Zone A FS Report. Please note that while we have reviewed some aspects of the groundwater flow and solute transport model discussed in Appendix B of the FS Report, detailed review of the model will be deferred until such time as the digital data files are also made available.

Specific comments on the FS Report are:

- (a) The FS Report fails to acknowledge or address the ongoing occurrence of perchlorate in the Deep Aquifer in the area northeast of the Olin Site, which is impacting operating water supply wells of the City of Morgan Hill. Groundwater impacts in this area due to the Olin Site are well documented,





particularly with the most recent data from the Third Quarter 2006 Groundwater Monitoring Report submitted by Olin on October 30, 2006 (MACTEC 2006c). Any cleanup feasibility study by Olin should also address impacted groundwater east, north, and northeast of the Olin Site.

(b) Olin states that perchlorate in the Nordstrom Park well "... is unrelated to operations at the former Olin/Standard Fusee facility." (FS Report p. 5-5), with reference to the Olin Llagas Subbasin Characterization Report of March 29, 2006 (MACTEC 2006d). Although substantial evidence existed at the time of the March 29, 2006 report that the Olin Site was the source of perchlorate, additional data collected by Olin in 2006 has provided irrefutable evidence of northerly groundwater flow in the Middle and Lower Deep Aquifer zones from the Olin site toward the Nordstrom well, and extremely strong evidence that there is a continuous plume of perchlorate that extends from the Site to at least the Nordstrom well. These facts and findings are described in detail in our November 22, 2006 review comments on Olin's Third Quarter 2006 Groundwater Monitoring Report to RWQCB (WorleyParsons Komex 2006b), so they will not be repeated herein.

(c) Olin states and re-states that groundwater extraction and treatment to the proposed cleanup level for Priority Zones B and C, or to background for sub-PHG areas beyond Zone C, is infeasible because "...groundwater extraction would induce adverse effects to the aquifer, such as local dewatering, pumping well interference, and groundwater quality degradation related to over-pumping." (FS Report p. xv (two occurrences); similar statement also on p xii, 4-8, 4-11, 4-12, 7-10, 7-17), and that "Hydraulic containment and treatment of groundwater with perchlorate greater than the MDL cannot be accomplished without disrupting the operation of existing pumping operations." (FS Report p 4-17). Despite the fact that Olin has developed a sophisticated groundwater flow model that could readily document any such effects, no model results or other calculations are provided to substantiate these claims. For example, no maps of projected drawdown due to groundwater extraction alternatives are presented. Similarly, no projections of remediation-induced drawdown at existing wells are presented in the FS Report. Furthermore, this statement avoids mentioning that Olin proposes that all groundwater extracted for Zone B, C and sub-PHG zone remediation would be simultaneously re-injected into the aquifer, minimizing any long-term or large scale effects of pumping. The model and all necessary files should be provided not only to the RWQCB but to other stakeholders as well, including the City. Further, the City believes that to reach any conclusions without having the opportunity to review the model is counter indicated.

(d) Specifically with respect to groundwater extraction and treatment for the Priority B Zone, Olin states that "Any effort to pump an additional 1,000 AF per year would likely create local pumping interferences that could impact existing groundwater users. As such, ...the potential adverse impacts on beneficial uses results in eliminating this alternative for further consideration for this Priority Zone." (FS Report p. 7-10). As noted above, Olin's suggestion of pumping interference due to remediation groundwater extraction is unsubstantiated by information provided in the FS Report, and represents nothing more than conjecture. Moreover, Olin notes that "annual demands by the water systems operated in the cities of Morgan Hill and Gilroy are currently about 15,000 acre-feet per year..." (FS Report p 6-2,3). The relatively small amount of 1,000 acre-feet per year of treated water from groundwater extraction in Priority Zone B could easily be used to replace some of the above-noted municipal pumping, with no little or effect on groundwater resources of existing groundwater users.





In the absence of substantiation of any adverse effects on groundwater resources due to groundwater extraction to background levels, we must conclude that there is *no* technical basis to propose a cleanup level greater than background, as required by Resolution 92-49 and Resolution 68-16 (Anti Degradation Policy). The cleanup goal of 6 ug/L proposed by Olin represents a degradation of groundwater in the Llagas Subbasin and is, therefore, not acceptable to the City nor should it be to the RWQCB as set forth in the October 6, 2006 RWQCB letter, that the proposed 6 ug/L cleanup level is "... clearly inconsistent with the State' Water Board's anti-degradation policy (Resolution no. 68-16)."

(e) As part of their explanation for establishing a cleanup level higher than background under the conditions of Resolution No. 92-49, Olin states that "Concentrations above background in groundwater will rapidly attenuate downgradient from areas of active remedial solutions" (FS Report p. 4-10). However, no technical basis to support this highly optimistic forecast is presented in the FS Report. Clearly, high levels of perchlorate in Zone I groundwater persist downgradient of the active on-Site soil and groundwater remediation that has been ongoing for nearly three years (since February 2004; FS Report p 5-1), contradicting Olin's contention of rapid perchlorate attenuation downgradient of active remediation.

(f) With reference to cleanup levels at the UTC site, Olin states that "Resolution 92-49 requires that Water Boards be consistent in comparable cases and thus the PHG, as approved for the UTC site, ... should also apply in the case of the Olin Site." (FS Report p 4-19, 20). We note that Order No. R2-2004-0032 (included with this letter as Attachment A) for the UTC site from the San Francisco Bay Regional Water Quality Control Board specifies a cleanup level of 6 ug/L (PHG) for on-Site water (both groundwater and surface water), however the same order also specifies the following prohibition:

"Specifically, no detectable concentrations of contaminants shall be allowed in surface waters or underflow at or beyond the property boundary..."

As explained by Keith Roberson, the San Francisco Bay Regional Water Quality Control Board regulator assigned to the UTC case, this prohibition restricts perchlorate in off-site groundwater to non-detect with respect to the analytical method detection limit (personal communication, January 17, 2007). We do not concur with Olin on this point, and conclude that it is unreasonable for RWQCB to apply these same standards to the Olin on-Site clean up level. The UTC site is huge, many times the size of the Olin Site. It is in a relatively remote area that is still largely undeveloped. The Olin site, in contrast, is small and situated in the middle of a populated area and has already degraded water quality in the Llagas Basin that serves thousands of people with drinking water. As for off-Site cleanup level, it is reasonable that the two sites should be treated the same, that is, an off-Site prohibition of perchlorate concentrations in groundwater greater than the MDL of EPA Method 314, (i.e., 1.4 ug/L) as noted by RWQCB (October 6, 2006).

(g) Olin's reliance on dilution and dispersion as dominant mechanisms allowing the feasibility of the Monitored Attenuation (MA) option may be based on optimistic expectations. Olin counts on appreciable dilution from anthropogenic recharge from the Madrone, San Pedro and other recharge ponds operated by the Santa Clara Valley Water District (SCVWD). For example, with respect to



reduction of perchlorate mass flux between Area I and Area II, Olin state that dilution of 40 to 60 % imported water between Area I and II is anticipated, and thus the "...additional source of water from the percolation ponds thus results in a reduction in perchlorate concentration" (FS Report p 3.14). Beyond this, the map of percentage pond recharge water in the Intermediate Aquifer (FS Report Figure 3.9) clearly shows that the calculated percentage of pond water in the vicinity of the plume core in Area I is much closer to 30 % or less.

Moreover, even this magnitude of dilution may be optimistic for three reasons:

(1) the main SCVWD recharge ponds are located well to the east of the Olin site and the Area I plume, and the dominant flow direction in the Shallow and Intermediate aquifers in this area is to the southeast, as shown in FS Report figures 3.2 and 3.3. Consequently, considering the likely dominance of advection as a plume migration mechanism in the Llagas subbasin, and the probable pathlines or "streamtubes" to be followed by the recharge water, it is unlikely that significant transverse lateral mixing of the recharge water and the Area I plume would occur. This could easily be demonstrated through particle tracking and solute transport modeling with Olin's groundwater model, but no such simulations were run.

(2) Evaluation of concentration trends in monitoring wells, discussed in FS Report Appendix C, indicates that over two-thirds of wells do not show a decreasing trend in perchlorate concentrations. Consequently, dilution and dispersion are not actively reducing concentrations.

(3) The development of a thin, 10-mile long plume from the Olin site suggests that advection is the dominant transport mechanism, and dilution and dispersion are not effective mechanisms for long-term reduction of perchlorate concentrations.

(h) Olin suggests that denitrification is occurring in the Deep Aquifer and the corresponding occurrence of biological reduction of perchlorate is an operational mechanism for perchlorate attenuation in the Llagas Subbasin (FS Report p 3-13 and 4-16). Other than the absence of high nitrate concentrations in some portions of the Deep Aquifer, there is *no* evidence to support the contention that denitrification or perchlorate reduction is occurring in the Deep Aquifer. In fact Figure 3-13 shows that nitrate concentrations in the Deep Aquifer downgradient of the Site are nearly everywhere in excess of 20 mg/L; similarly, perchlorate concentrations above the PHG are observed extensively in the Deep Aquifer downgradient of the site, as shown in Figure 3-18. Both of these facts clearly suggest that neither denitrification nor perchlorate reduction are occurring to any appreciable extent in the Deep Aquifer zone downgradient of the Site. This observation contradicts Olin's statement that, in part due to biological reduction of perchlorate, "... perchlorate concentrations above the hypothetical background would not persist in the presence of these attenuation processes." (FS Report p 4-16). Under the groundwater conditions present in the Llagas Subbasin, perchlorate must be considered as a persistent contaminant and, therefore, Olin's supposition is inapposite to the requirements with respect to persistence and permanence of effects for establishing an alternate cleanup level under Resolution No. 92-49.



(i) The groundwater flow and transport model used to evaluate various remediation alternatives including capture zones, groundwater extraction rates and cleanup times, is partially documented in FS Report Appendix B. Numerous deficiencies and errors in the modeling are evident from initial review of Appendix B. The documentation is very incomplete, particularly in terms of calibration (both flow and transport) and sensitivity analysis. As noted above, a thorough review of the Olin groundwater model will be provided at later time, once the model files have been made available.

(j) Olin's analysis of remedial alternatives and scoring of those alternatives in Section 7 of the FS Report contains several inconsistencies which act to bias the ranking of the alternatives. Some of the inconsistencies are within FS Report Table 7.1 itself, whereas other are evident when the scores present in FS Report Table 7.2 are compared against the criteria analysis in FS Report Table 7.1. The issues of concern relate primarily to the analysis and ranking of Alternatives 2 (MA) and 3 (Groundwater extraction/treatment) for Priority Zones B and C. To illustrate these inconsistencies, the relevant portions of FS Report Tables 7.1 and 7.2 are combined and reproduced in the attached Table 1. Although some differences in scoring between Zone B and C should be expected for a given Alternative and Criterion, generally the scoring should be consistent with the analysis provided.

(i) For example, in FS Report Table 7.1, the analysis of the criterion, "Reduction of Toxicity, Mobility, Volume" for Priority Zone B, Alternative 3, is given as "Significant reduction of toxicity, mobility, and volume in treatment area", whereas the analysis for this same criteria for priority Zone C is given as "Limited reduction of toxicity, mobility, and volume - due to well head treatment - tracked." Since private wells in both Priority Zones B and C are subject to wellhead treatment, the reason for this discrepancy in analysis appears unsupportable. The analysis and scoring of this criterion for both Zones B and C should be the same. Note that we have no objection to the score assigned (i.e, value of 3); however, the score value should reflect the same or similar analysis. Note that this type of inconsistency is highlighted in Table 1 with cells that are shaded brown.

(ii) Similarly, FS Report Table 1 has several inconsistencies where the different scores are assigned to criteria with the same analysis. For example, for both Priority Zones B and C, Alternative 2, the "Compliance with Regulatory Requirements" criterion analysis is stated as "Does not actively comply with Resolution No. 92-49", yet this criterion is ranked with a value of 4 for Priority Zone B, and 5 for Priority Zone C. It is hard to understand how an alternative that "Does not actively comply with Resolution No. 92-49" can be assigned a score of 5 out of 5, so presumably the scoring of 4 is more appropriate. As another example of this inconsistency, analysis of the "Overall Protection of Human Health and Environment" criterion is given as "Protects human health and environment by reducing mass of perchlorate, and by IX systems on supply wells. High degree of protection" under Alternative 3 for both Priority Zones B and C, yet the criterion is assigned a value of 5 in Zone B, but only 4 in Zone C. Based on the stated analysis, presumably the ranking for both zones should be more appropriately scored as 5. Yet another, more extreme example of this inconsistency is seen under the "Stakeholder Acceptance" criterion for Alternative 3, where the same analysis, "High Stakeholder Acceptance", is scored as 4 for Priority Zone B, but scored as only 2 for Priority Zone C. Again, based on the common analysis, presumably a value of 4 would apply to both zones. Note that this type of inconsistency is highlighted in Table 1 with cells that are shaded blue.



(iii) A third type of scoring inconsistency in FS Report Tables 7.1 and 7.2 are criteria where appreciably different analysis is assigned the same scoring value. For example, for both Priority Zones B and C, the analysis for criterion "Short Term Effectiveness" is given as "Not effective in short term" for Alternative 2, and "Moderate effectiveness in short term" for Alternative 3, yet both are assigned the same score of 3. Presumably, an alternative that is "not effective" should not be scored the same as one that is moderately effective, so a more appropriate scoring might be a value of 3 for moderately effective and a value of 1 or 2 for not effective. Another example of this type of scoring inconsistency is seen for the criterion "Compliance with Regulatory Requirements" in both Priority Zones B and C, which is described as "Does not actively comply with Resolution No. 92-49" for Alternative 2, and "Complies with regulatory requirements" for Alternative 3, yet both are assigned a score of 4. Again, presumably a lower score, perhaps 2 or 3, should be assigned to the alternative that does not comply with regulatory requirements, whereas an alternative that does comply could be assigned a score of perhaps 5. Note that this type of inconsistency is highlighted in Table 1 with cells that are shaded green.

(iv) WorleyParsons Komex undertook a re-scoring of the criteria and alternatives in Table 1 (from FS Report Table 7.1 and 7.2) to make the scores consistent with analysis for each criterion and alternative. The proposed revised scoring is included in Table 1 below Olin's scoring (from FS Report Table 6.1). Note that other than addressing the types of inconsistencies noted above, the proposed revised scoring preserves the integrity of Olin's original scoring. The proposed re-scoring shows that Alternative 3 (Groundwater Extraction/Treatment) ranks higher than Alternative 2 (MA) for both Priority Zones B and C. Consequently, the preferred remedial alternative for both Priority Zones B and C is groundwater extraction and treatment, not monitored attenuation, as scored by Olin.

(k) Olin's projections of cleanup time for remediation Alternatives 1 (Priority Zone A groundwater extraction/treatment) and 3 (Priority Zones B and C, plus sub-PHG groundwater extraction/treatment) are based on simulated concentrations versus time from the groundwater flow and transport model at a very small number of selected locations, corresponding to existing monitoring wells: 5 in the shallow aquifer, and 4 each in the intermediate and deep aquifer, with only one depth per location (FS Report p 7.4, Figures 7.4, 5, 6 (Zone A); p. 7-9, Figures 7.10, 11, 12 (Zone B); p. 7-16, Figures 7.16, 17, 18 (Zone C); and p 7.20, Figures 7.22, 23, 24 (Sub-PHG zone)). Based on the information provided in the FS Report, there is no way of knowing how representative these few locations are of overall plume remediation. The four to five selected locations generally include one plume core location situated within or near the core of the plume in Priority Zone A (MW-16 or 17), one location downgradient of Priority Zone B (e.g., MW-21), and two further down-gradient locations located on the western fringe of the plume in the sub-PHG zone (MW-26 and 51). None of these locations appear to be located within Priority Zone B or C; however, this is difficult to distinguish accurately since no map of the extent of these Priority Zones is presented in the FS Report. Consequently, the reliability of Olin's projected cleanup times based on the time-concentration plots from this limited number of locations must be questioned. A far better representation would have numerous additional target locations including a range of geographic and depth locations, focusing on the plume centerline, but also including fringe areas and locations directly downgradient of the plume leading-edge at various concentration levels. In addition, a series of plume maps over a range of



snapshot times (e.g. 2, 5, 10, 15, 20 years) would better show the overall progress of each remedial alternative.

(l) There are numerous inconsistencies between the narrative explanation of remedial alternatives presented in the text of Section 7, the listed quantities presented in the associated tables, and estimated costs presented in Appendix D. For example, Section 7.4.3 presents a narrative explanation of the Alternative 3, Ex Situ treatment of groundwater for Priority Zone C, and references numbers of pumping wells and flow rates presented in Table 7.4, and estimated costs presented in Appendix D, Table D.6. The number of pumping wells for this alternative presented in Table 7.4 is 7 wells, the number of pumping wells presented in Table D.6 is 3 wells. The flow rates for the pumping wells presented in Table 7.4 total 2,200 gallons per minute (gpm). The flow rates for the pumping wells presented in Table D.6 total 600 gpm. With Table D.6 itself, the unit cost for conveyance piping is presented as 100 \$/LF under "Assumptions" and the applied at a rate of 200 \$/LF under "Capital Costs".

(m) Costs presented in Appendix D were not estimated in a manner consistent with guidance published by the United States Environmental Protection Agency (EPA 2000). EPA has a published guidance document titled, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study." The document was published in July 2000 and presents EPA policy on use of a discount rate for NPV calculations. The NPV discount rate recommended by the EPA is 7 percent, which has been adjusted to eliminate the effect of expected inflation. The Report uses an escalation rate of 3 percent and a NPV discount rate of 5 percent. As a results, the costs presents in the Report are significantly higher than the EPA would accept. For example, for Priority Zone B, Alternative 3, Ex Situ, the Report estimates a cost of \$43.7M (however, there appears to be a calculation error in this item; the correct total cost should be \$24.0M). The cost for this alternative using EPA protocol would total \$16.8M, a significant difference in either case.

(n) There are numerous instances where insufficient information is provided in Section 7.0 to support the implementability, effectiveness, and cost of the remedial alternatives, let alone support the detailed analysis using the criteria presented in Table 7.1. For example:

- The extraction wells and reinjection wells presented in the cost estimating tables in Appendix D and Table 7.4 are not identified on the figures presented in the report.
- The route of the conveyance piping between the extraction wells and reinjection wells is not identified on the figures presented in the report.
- The size of the storage tanks are not provided.
- The capacities of the components of the ion exchange based treatment system are not provided.
- The basis for the ion exchange resin usage estimate is not provided.
- The basis for pumping costs is not provided.



This information is necessary to validate the costs and related conclusions presented in the report.

(o) Costs presented in Appendix D apply higher percentages for engineering services than EPA recommends. The Report applies a total percentage to the remedial alternative capital cost of 45% for the design, construction management, and project management services. The EPA recommends a total percentage of 17% for the services. Therefore, the Report presents a capital cost for Priority Zone B, Alternative 3, Ex Situ treatment of \$9.5M, whereas following EPA guidance would lead to an estimate of \$7.9M; a significant difference.

(p) Costs presented in Appendix D use the worst case times projected to achieve cleanup levels, not considering that portions of the aquifers will cleanup sooner than others. For example, Table 7.5 lists times to achieve cleanup goals if Alternative 3, Ex Situ Treatment were implemented in Priority Zone C. The table identifies four well locations each in the shallow, intermediate, and deep aquifers, and the respective times to achieve the cleanup goals at each well location. The times listed in Table 7.5 are from 0 years to 5 years for wells in the shallow aquifer, 0 years to 5 years for wells in the intermediate aquifer, and 1 year to 20 years for wells in the deep aquifer. Only one well location in the deep aquifer is projected to require 20 years to achieve the cleanup goal. The other well locations in the other aquifers are projected to reach the cleanup goal in 5 years or less. However, the cost estimate prepared for the alternative does not take in consideration the fact that portions of the aquifers will cleanup sooner than others. In the case of portions of the aquifer reaching the cleanup goal sooner than others, 7 wells pumping 2,200 gpm from year 5 to year 20 at a cost of \$9.5M may not be required. It may only require 1 well pumping 900 gpm from year 5 to year 20 at a significantly lower cost. However, this analysis has not been performed. Therefore, the cost estimates may be excessive.

WorleyParsons Komex hopes this review is helpful to the RWQCB in your ongoing efforts to cleanup perchlorate released from the Olin Site. We are at your disposal to discuss any of the comments above. If you have any questions or need additional information please call Mark Trudell at 714 379-1157, extension 161.

Sincerely,  
WorleyParsons Komex

Mark Trudell, Ph.D., PG, CHG.  
Principal Hydrogeologist  
enc.

Steve Winners, PE  
Senior Engineer



**WorleyParsons Komex**

resources & energy

cc: Mr. Jim Ashcraft, City of Morgan Hill  
Mr. Steven Hoch, Hatch and Parent



## REFERENCES

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006a. Llagas Subbasin Cleanup Feasibility Study for the Olin property at 425 Tennant Avenue, Morgan Hill, California. June 30, 2006

MACTEC 2006b. Cleanup Level for Perchlorate in Off-Site Groundwater, 425 Tennant Avenue Site, Morgan Hill, California. January 31.

MACTEC 2006d. Llagas Subbasin Characterization Report, Santa Clara County, Olin/Standard Fusee, Morgan Hill, California. March 29.

MACTEC 2006c. Third Quarter 2006 Groundwater Monitoring Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California. October 30.

GeoSyntec Consultants (GeoSyntec), 2006a. Soil In Situ Bioremediation System Closure Report. July 18.

Regional Water Quality Control Board Central Coast Region (RWQCB), 2006a Letter from Roger W. Briggs, Executive Officer, Water Board, Central Coast Region to Richard W. McClure, Olin Corporation: SLIC: 425 Tennant Ave. Morgan Hill; Llagas Subbasin Cleanup Feasibility Study. October 6, 2006.

RWQCB 2006b. Letter from Roger W. Briggs, Executive Officer, Water Board, Central Coast Region to Richard W. McClure, Olin Corporation: SLIC: 425 Tennant Ave. Morgan Hill; Proposed Cleanup Level for Perchlorate in Off-Site Groundwater. March 2, 2006.

United States Environmental Protection Agency (US EPA), 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, Report No. EPA 540-R-00-002, OSWER 9355.0-75. July 2000.

WorleyParsons Komex 2006a. Review of Olin Corporation June 30, 2006 Llagas Subbasin Cleanup Feasibility Report. Letter to Hector Hernandez, RWQCB. July 24, 2006.

WorleyParsons Komex 2006b. Review of Olin Third Quarter 2006 Groundwater Monitoring Report. Letter to Hector Hernandez, RWQCB. November 22, 2006.23 CCR s 2550.4. Concentration Limits.